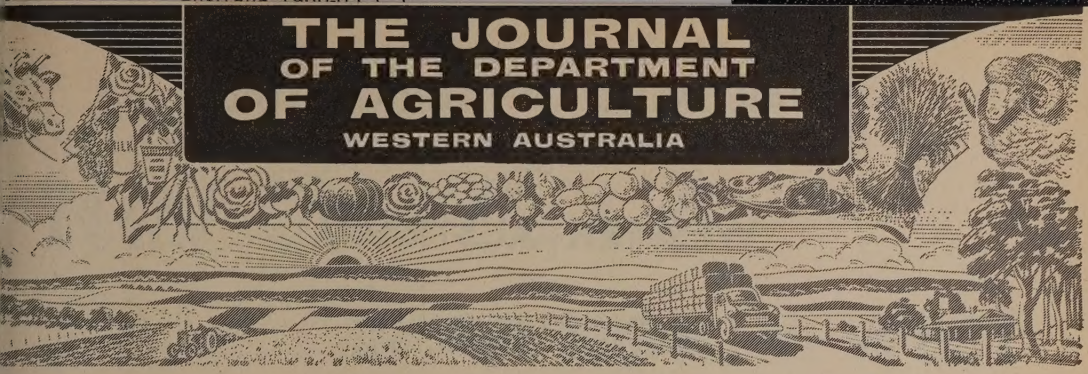

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COVER PICTURE

CHRYSANTHEMUM HARVEST

A colourful glimpse of large-scale flower growing on a nursery near Perth.

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Wild Dog Control IN THE NORTH-WEST

By R. J. FRASER, Regional Vermin Control Officer, Port Hedland

BECAUSE of its sparsely-settled condition, the North-West of Western Australia is almost an ideal breeding-ground and hunting-ground for wild dogs. Even the best of the pastoral country is but thinly populated and there are large areas of rugged country which is seldom traversed by white men.

Wild dogs have always been listed among the pastoralists' "headaches" in these areas but they would present a much more serious problem were it not for the efforts of the "doggers" employed by the Agriculture Protection Board.

In the Pilbara region alone, there are usually from six to ten full-time doggers operating. Each man has a well-defined area in which he works. He must be an expert bushman as he often operates alone over a huge area of wild country. He must know wild dogs and their habits for he often has to pit his skill and knowledge against dogs which experience has rendered more than usually cunning. In addition he must know all about trapping and baiting, be a good tracker, a good horseman and have more than a passing knowledge of motor vehicle maintenance as he works in rough country far from garages and service stations.

The Pilbara doggers operate over an area embracing the Roebourne, Tableland, Marble Bar, Port Hedland and Nullagine Vermin Board's territories. This takes in some very rugged isolated country such as that in the vicinity of the Rudall River and Broadhurst Ranges some 300 miles east of Nullagine.

Fig. 1.—A team of doggers about to start a drive from Millstream Station

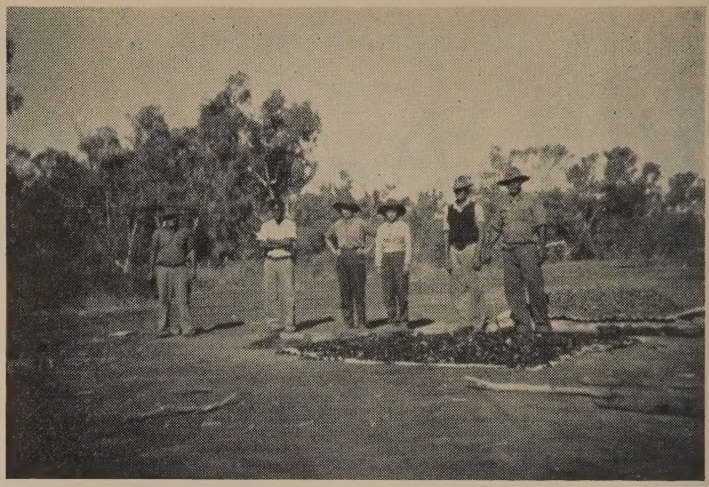

Fig. 2.—Doggers and helpers with a mass of baits they have prepared

Doggers traverse these areas laying baits, trapping and poisoning carcasses. On the ground baiting drives, each man usually takes 5,000 prepared baits each containing one half-grain strychnine tablet. In addition, he carries 10 oz. of strychnine crystals for carcass baiting using kangaroo or other meat. The prepared baits are put down near watercourses, creeks, rockholes or on any well-used "beats" patrolled by wild dogs.

SAFETY PRECAUTIONS

Doggers, using four-wheel-drive vehicles, usually commence from a certain point and work as a team with each man covering a certain area and meeting the remainder of the team at a pre-determined spot every three or four days.

This ensures that, in the event of a vehicle breakdown, the man's plight is known and he is not too far away to be rescued promptly.

Instructions are given that no man is to put up a smoke unless he is in trouble. This means that a smoke in a certain area is a clear indication that help is needed and the nearest man loses no time in rendering assistance.

The professional doggers are of great help in protecting the sheep areas from wild dog attacks. They operate on the fringes of settlement, often in areas which even the four-wheel-drive vehicles cannot reach—country that can only be traversed on foot or on horseback.

Here they lay their baits, particularly at mating time when the dogs are hungry and apt to be less cautious. Big baiting drives are organised in April-May when the breeding season commences. Last year 63,000 prepared baits were laid at this time, plus a number of carcass baits.

In July-August the doggers destroy a large number of wild dog pups which

Fig. 3.—Dogger with packhorse, heading into rugged country

would normally move out of their lairs in September to harry the pastoralists' flocks. Last year they killed 45 adult dogs and 156 pups in these areas. Their tally for 12 months was 435 dogs.

PASTORALISTS HELP

Pastoralists are playing an important role in keeping down wild dog populations by keeping rivers and creeks leading into their stations well baited and by forming into groups to employ doggers on a 50-50 basis with the A.P.B.

In October, the pastoralists in conjunction with the A.P.B. carried out a drive over the whole of the Pilbara area. The country was divided into seven zones and the A.P.B. supplied one dogger and 10 oz. strychnine to each zone plus 50,000 prepared baits to be distributed equally through the seven zones. The pastoralists supplied two men per zone plus whatever horses were needed.

AERIAL BAITING

Coincidentally with the October ground baiting drive, aerial baiting was carried out using an Auster aircraft which dropped 15,000 baits each trip in otherwise almost inaccessible areas. The aircraft covered over 3,000 miles in some 34 hours of flying time, and dropped 125,000 baits. A further 155,000 baits were laid in three ground-baiting drives during the 12 months which ended June 30, 1959.

This Hillside was once Badly Gullied

Erosion gullies are caused by running water. No gully filling should be carried out unless provision is made to stop that water running in the future. Good pasture cover and contour working make runoff less likely and contour banks make sure that what does run will not cause damage. If gullies have been filled in the past and by chance they are still well grassed they are still vulnerable to erosion if cultivated. Old stabilised gullies should be protected by contour banks before the next crop goes in. The evening light shows healed gullies in the background on this photograph taken near York.

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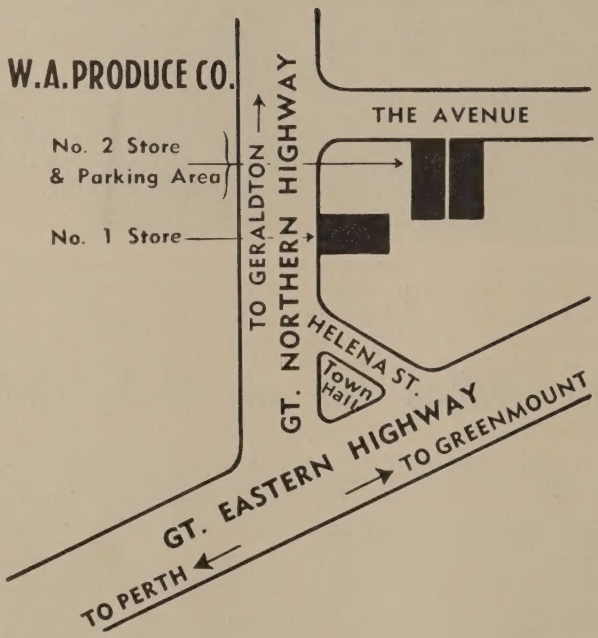

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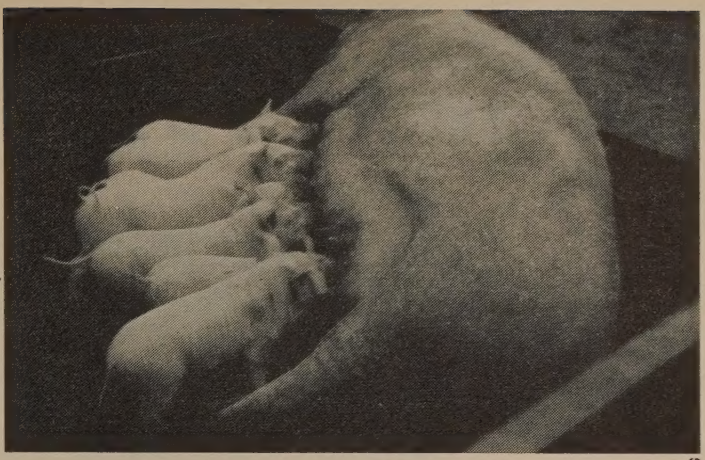


Fig. 1.—Well-managed sows milk well and rear healthy piglets.

THE CARE OF THE BREEDING SOW

By P. C. BECK, Field Assistant, Dairying Division

PIG-RAISING is a specialised field of animal production, which, to be profitable must incorporate both a scientific and a practical approach. These two factors must be complementary, for without a sound practical approach, the value of the scientific principles involved, e.g., in breeding and compounding rations would accordingly be reduced.

Husbandry in respect to pig-raising could broadly be defined as a closely-adjusted combination of breeding, feeding, housing and general management. Good husbandry is only achieved through an efficient combination of each of these units.

The selection and care of the breeding sow and her litter is one phase of pig-raising which requires a high standard of husbandry if the best results are to be achieved.

BREEDING

Many factors are involved when the term breeding is used. Firstly, it means the selection of breed. This must initially be governed by the type of pig the pig raiser wants to breed and the adaptability of the breed to a particular set of environmental conditions. The wide variation in climates experienced in this State warrants some thought in this direction.

For instance, it has been observed that under the normal and in some cases harsh conditions of management in the northern wheatbelt areas, the purebred Berkshire and also its crosses with the other breeds have a superior growth performance and appear more healthy than the average purebred Large White under the same conditions. This would appear to arise from the lesser ability of the Large White to withstand the hot climate in these areas.

Upon selecting the breed the next important consideration must be the selection of individuals from which the pig-raiser will breed.

Purebred animals whose ancestors reveal records of prolificacy, that is the ability to produce large litters, should be selected. Rapid growth rates are of great

economic significance, and the ability to produce the type of carcass which meets market demand is most important. Selection must take into account conformation and constitution of the sow, preferably at the baconer stage of growth, when the sow's progeny will usually be marketed.

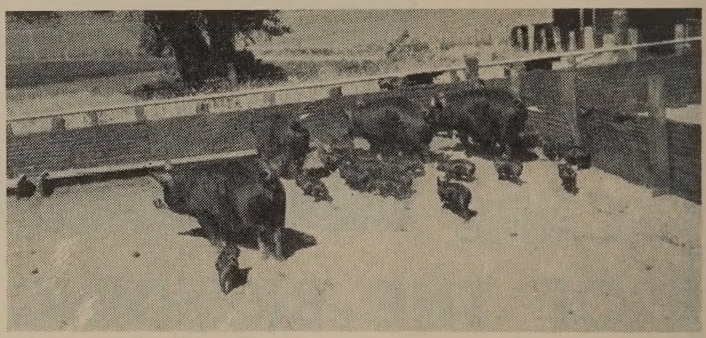


Fig. 2.—Excellent types of Berkshire sows with high litter-bearing capacity

Fig. 3.—Mated Berkshire gilts in excellent condition

Heritable defects, such as hernia, blind, inverted or irregularly-spaced teats, under or over-shot jaws must be avoided. The sow and also the boar should reveal 12 or more well developed, evenly-spaced teats which extend well forward on the underline. Do not tolerate any tendency towards weakness in the legs of breeding stock, particularly in the pasterns which should be strong and as straight as possible.

THE SOW

The sow throughout her productive life fulfils a monumental task. She is expected to produce six or more litters. In each case from when the sow conceives she must carry her litter for a gestation period of about four months, deliver them safely, and then proceed to suckle and rear the litter for a period of two months until the piglets are weaned. During each of these reproductive cycles the sow must not only carry the responsibility of the litter, but maintain her own health and body condition and also remain free of disease.

To enable her to produce the best possible results, the sow must receive a great deal of care and good management. Perhaps the foremost consideration is to see that she maintains her bodily health. This should be done by feeding correctly at a level of nutrition which is in relation to the period of the breeding cycle into which the sow is about to enter. Her bodily food reserves must be sufficient to meet forthcoming demands, in particular, the carrying of the unborn litter, while at

the same time maintaining the condition which will enable here to produce well during her period of lactation.

THE MAIDEN SOW

It is very important that maiden sows be given the opportunity to develop fully before being mated for the first time. When the gilt is eight to nine months old and well-grown (weighing approximately 250 lb. liveweight) she may be introduced to the boar. It has been frequently observed that sows when mated in an undeveloped condition have not grown to maximum size and their capacity to rear subsequent large litters is reduced.

BODY CONDITION BEFORE MATING

The sow, after her litter has been weaned, will often be in a thin condition. If this is the case it is advisable to wait for a period of three weeks before mating. During this period she should be fed well and brought back to a firm but fleshy body condition, and then mated. If a sow is excessively fat, a light diet should be provided to slim her down until approximately a week before service is due. The feeding rate should then be increased as a means of "flushing"—to achieve a greater release of ova and increased litter size. The practise of flushing in the case of all sows before mating is highly desirable.

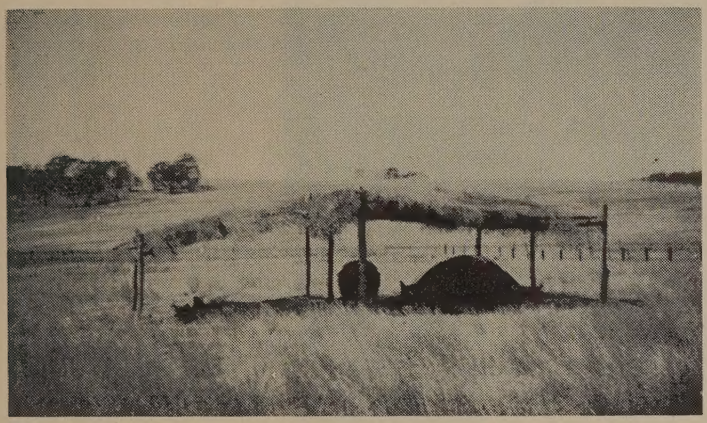


Fig. 4.—Summer shade is most important for breeding sows

Fig. 5. — This well-constructed shed containing farrowing pens is on a northern wheatbelt property.

MATING

The pig-raiser in the normal course of observation of his breeding sows soon becomes aware of the signs which indicate the sow is "in season." The period of heat or oestrus lasts, on an average, about two

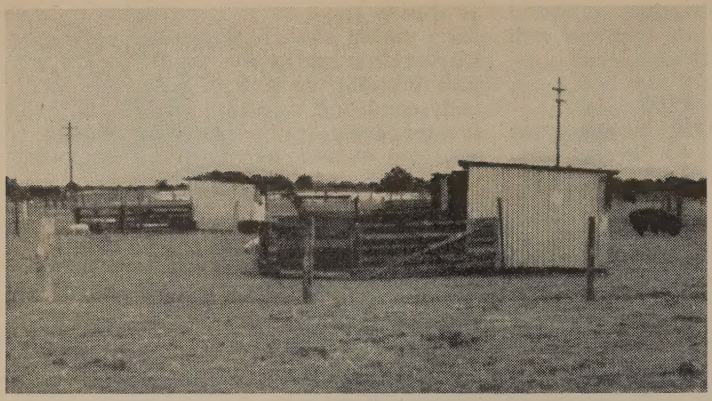


Fig. 6.—Portable sheds and feeding yards for suckling sows and litters

days and it is generally recommended for best results, that the sow be served about 24 hours after she comes "in season." This may not always be accurately observed however and a good practical recommendation would be to mate the sow on the morning after she is initially observed on heat. It is usually sufficient, if the boar has covered the sow for a period of three to five minutes to concede that the service has been successful. The practise of allowing the sow to remain with the boar for several hours is unnecessary. However, if the boar is used infrequently he may become temporarily sterile and a second service is desirable in this case. Introducing the sow again to the boar approximately 10 to 12 hours later should overcome this.

If possible from a practical point of view, it is desirable to remove the sow, after service, to a pen of her own where she should remain quietly for a period of about 12 hours. This practice enhances the prospect of the service being effective.

The interval between heat periods is normally 21 days. If the sow does not return to service at the end of 21 days she may then be regarded as being in pig.

FEEDING AND CARE DURING GESTATION

This is a most important phase as it has a great bearing on the sow's ability to nurture the unborn litter and thus on the health and vigour of the litter when born. In addition the milk supply after farrowing is very much dependent on feeding and husbandry during the gestation period.

The sow must not be allowed to become low in condition, and overfatness must also be avoided as it can result in difficult presentation and possibly piglet deaths at farrowing.

At this stage the main concern is to maintain the sow in good condition and free from disease. This process must begin directly the sow's former litter has been weaned and she has been remated. Feeding at this stage should be designed to bring the sow rapidly into a firm but fleshy condition so that the body reserve of food is built up early in the gestation period. Once this condition has been achieved the ration must be adjusted so as to retain this condition until farrowing. Building up the body food reserve in the initial stages of gestation is a good plan.

Much of this reserve will be drawn on by the unborn litter, especially in the latter stages of pregnancy, but there should still be sufficient to ensure a good milk supply after farrowing.

The pig-raiser should remember that heavy feeding during the late pre-farrowing period can cause trouble and piglet losses due to sows farrowing with congested or overstocked udders.

Exercise and grazing, preferably of green material are very essential for the in-pig sow. Exercise helps to maintain health, and grazing provides many of the essential minerals and vitamins required by the pregnant sow. During the summer when green material is not readily available a Vitamin A supplement should be added to the ration. The provision of a protein-rich meal (meatmeal) in the diet is necessary and a calcium supplement usually in

the form of limestone fines is also essential. Plenty of trough space for in-pig sows is important to ensure that jostling and fighting does not occur, and ample fresh, clean water must be available at all times. The average in-pig sow, depending on condition and size will consume in the vicinity of 6 lb. of meal or its equivalent daily.

The provision of shade in the summer and warm housing in the winter are most beneficial to the health and well-being of the sow.

Fig. 7.—Moving one of the portable sheds to fresh ground

PREPARATION BEFORE FARROWING

The sow should be introduced to her farrowing quarters not less than a week to ten days before she is due; this practice enables her to become accustomed to the new surroundings and gives her ample time to settle in before giving birth to her litter. During this time the sow should still be allowed to exercise outside. The eradication of external parasites such as lice should be carried out prior to farrowing.

A bedding of straw in which the sow can make a nest must be placed in the farrowing house. If this becomes soiled and damp, immediate replacement with fresh material is necessary.

Constipation of the sow at farrowing is a condition which must be avoided as it may lead to difficulties at birth which can result in the death of piglets. To prevent this occurring food of laxative nature should be incorporated in the ration shortly before farrowing. Bran mash is an excellent material in this case.

FARROWING

The sow in the act of giving birth to her piglets does not normally meet with any difficulties if she is in good condition and has been fed and managed well throughout pregnancy. It is not necessary to maintain a constant watch over her during farrowing. The exception may be the valuable sow who may be known to be clumsy and inclined to meet with some difficulty. Disturbing the sow at this time may cause her to become nervous or irritable with possibly a subsequent loss of piglets or injury to herself. A sound practice is to look occasionally to see that nothing abnormal has occurred. After the foetal membranes or "afterbirth" have been passed they should immediately be removed and preferably burnt or buried.

CAUSES OF PIGLET MORTALITY

The period from birth to weaning and in particular the first few days in the life of the piglet are the most vital. It is

during this period that the greatest likelihood of mortalities exists. There are a number of varied reasons for these deaths, many of which can be prevented by care and attention.

The most common cause of piglet mortality is trampling or overlaying by the sow. This is a factor which the pig raiser can control to a certain extent through good husbandry. He can assist by ensuring that his sows are not over fat and clumsy and by providing safety measures such as farrowing rails and hover boards which offset the clumsiness of the sow, plus artificial warmth in the form of infra-red ray lamps in a protected area where the young piglets may retreat into safety.

Chilling is another cause of death, which, if prolonged, results in a loss of vigour in the piglet which subsequently becomes so weak it is unable to move to a warmer area or to suckle the sow. Where crude, draughty and damp farrowing facilities exist, many deaths of this nature occur. Farrowing houses must be draught and moisture free, with, if possible, insulated concrete floors.

Diseases such as colds and pneumonia and also the common baby piglet scours also contribute to the heavy losses of young pigs.

Good sanitation with adequate drainage of excess moisture, clean bedding and clean feeding facilities are highly necessary.

Inflammation and congestion of the sow's udder with loss of the milk supply at farrowing is a source of trouble predisposing to piglet deaths through starvation. This condition may even aggravate the sow to the extent of her savaging her litter.

This condition can be obviated by a high standard of management and feeding throughout pregnancy and especially at the farrowing period.

Other losses are incurred through accidents, and many piglets are destroyed as runts or because of malformations and abnormalities.

A high standard of management and feeding of the sow, throughout the whole of her gestation period and at farrowing, in association with well designed farrowing quarters will greatly assist in reducing the high mortality rates.

FEEDING OF LACTATING SOW

During the early period of its life the young piglet lays the foundation of bone and muscle tissue which will eventualy develop into the finished carcass. One of the basic requirements for economic growth and high carcass quality is well-

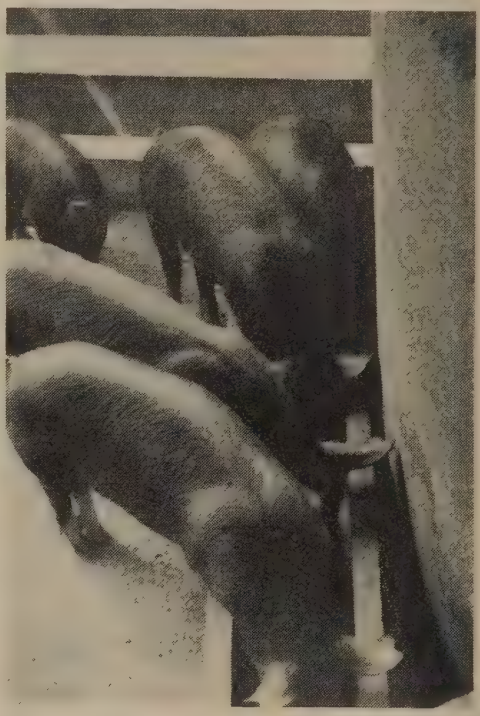


Fig. 8.—The intake of solid food by young growing pigs is highly important

grown weaners. To achieve heavy weaning weights, the early growth potentiality must be given every opportunity to develop to its full capacity.

For the first few weeks after birth the young pigs rely solely on the sow's milk, and it is most important that this natural and highly nutritious food be available in abundant supply. To ensure this, the sow must be fed according to two main factors —her own body condition and the number of piglets in the litter.

Firstly, after farrowing, it is desirable to withhold food from the sow for about 12 hours, although plenty of water must be available, then, a light diet containing

about 50 per cent. bran mash if constipation is apparent should be supplied.

During the first week after farrowing a ration of 4 to 5 lb. per day of a high protein meal should be provided. This meal is compounded at the rate of 15 lb. meatmeal (50 per cent. protein), 1 lb. limestone fines, ½ lb. salt, per 100 lb. crushed grain, to give approximately an 18 per cent. protein content. Subsequently, during the following two weeks this ration may be gradually increased until the sow is cleaning up readily enough food to keep her in good health and maintain her milk supply. The actual amount consumed depends on the number of piglets in the litter and the sow's condition, and it is only by careful observation that the feed requirements can be arrived at. A good guide however, is to feed on the basis of 2 lb. for the sow plus 1 lb. of meal for each pig in the litter. For instance if a sow has a litter of eight pigs she may be provided with 10 lb. of feed in two feeds daily. It is considered however, that 12 lb. is the maximum rate on this basis which of course is subject to variation depending on the condition of the sow.

CREEP FEEDING

Approximately three weeks after farrowing, the sow's milk supply reaches a peak and her production then begins to decrease. In addition the nutritional requirement of the young pigs is rapidly increasing. It is at this period that creep feeding of the litter must commence. Creep feeding simply means that the young pigs are provided with solid food in an area which is accessible only to themselves and which excludes the sow.

The creep feeding ration is designed to supplement the sow's milk supply, and as such to ensure rapid growth. The ration must therefore be palatable and rich in protein which is most essential for the proper development of muscle tissue. A ration compounded of 15 lb. meatmeal (50 per cent. protein), 1 lb. limestone fines, ½ lb. salt per 100 lb. of crushed grain has a protein content of approximately 18 per cent. and will be found suitable in the creep feeding ration. The feed must be available to the piglets at all times. It is most undesirable, however, to allow stale food to accumulate or feeding troughs to become dirty, as these factors readily cause digestive troubles and scouring. Fresh clean water must be available at all times.

During the period up to weaning it is desirable to allow the sow and litter free grazing for exercise and access to valuable minerals and vitamins which are available through this medium. If this is not possible the piglets should be given a sod of fresh clean earth from a pig-free area every day or so. In particular this will ensure that the piglets are receiving a regular supply of iron, which is deficient in the sow's milk.

WEANING

Weaning is normally carried out when the litter is eight weeks of age. It is a very critical period and must be managed with care and consideration. In separating the sow and litter it is important that the young pigs remain in the pen and surroundings they have become accustomed to and the sow should be removed. If the sow is a heavy milker, her ration should be reduced four or five days before weaning to assist the drying-off process.

If weaning is carried out with care and the young pigs are readily consuming solid food, and castration of males has been carried out well beforehand at three to four weeks of age there should be no reason for growth rates to be retarded to any extent. Any setback received at weaning has detrimental effect on the subsequent growth and development of lean meat on the carcass. With this in mind, pig-raisers would be well advised to exercise good care when weaning pigs to ensure that their growth rate is maintained at a high level.

Economy of production must be the aim of every pig producer. The selection, management and feeding of the sow and her litter plays a major role. The production of large rapidly-growing pigs of the correct type means greater profits and to achieve this the pig-raiser must realise the importance of his breeding sows.

CABBAGE GUM

(Eucalyptus clavigera A. Gunn, ex Schau.*)*

A—Branchlet with stalked leaves; B—Inflorescence with flower buds; C—Flower bud; D—Anthers; E—Fruits; F—Fruit in section

[Walcott Inlet, *Gardner* 1588]

TREES

of Western Australia

By C. A. GARDNER, Government Botanist

No. 55—CABBAGE GUM

(*Eucalyptus clavigera* A. Cunn. ex Schau.)

THIS tree is one of the common trees of Kimberley, inhabiting the sandy soils of the sandstone ranges, but is found less frequently on the sandy flat country. It is most common in northern Kimberley extending as far south as the King Leopold Range, and is less frequently encountered on the plains of the Ord and Fitzroy Rivers. The species is an erect tree 20 to 35 ft. tall with widely spreading densely-foliaged branches and horizontally-expanded leaves. The trunk attains a length of 18 ft. and a diameter of about 20 in.

The bark of the lower parts, and occasionally over almost the whole of the trunk is tessellated, flaky and thick, persistent and dark grey in colour; the bark of the upper part of the trunk is smooth and white, decorticating in large grey plates leaving the young inner bark at first a greyish-pink colour. The timber is red.

A characteristic of the tree is the rough surface of the leaves which are commonly broad and blunt at both ends, stalkless or stalked and frequently cordate at the base. The leaves are pale green in colour. The white flowers are borne on long stalks and arranged in condensed panicles along the branchlets, and the long-stalked fruits are conspicuously veined and fragile. They do not persist after the seeds have shed, and are rarely found on the trees later than the middle of May.

No. 56—LARGE-LEAVED CABBAGE GUM

(*Eucalyptus grandifolia* R. Br. ex Benth.)

THIS tree is closely related to the common cabbage gum but is of taller growth, and the branches are more erect. The bark is usually quite smooth throughout, although a collar of tessellated bark sometimes occurs close to the ground, and the leaves are thicker, devoid of any excrescences, and lustrous.

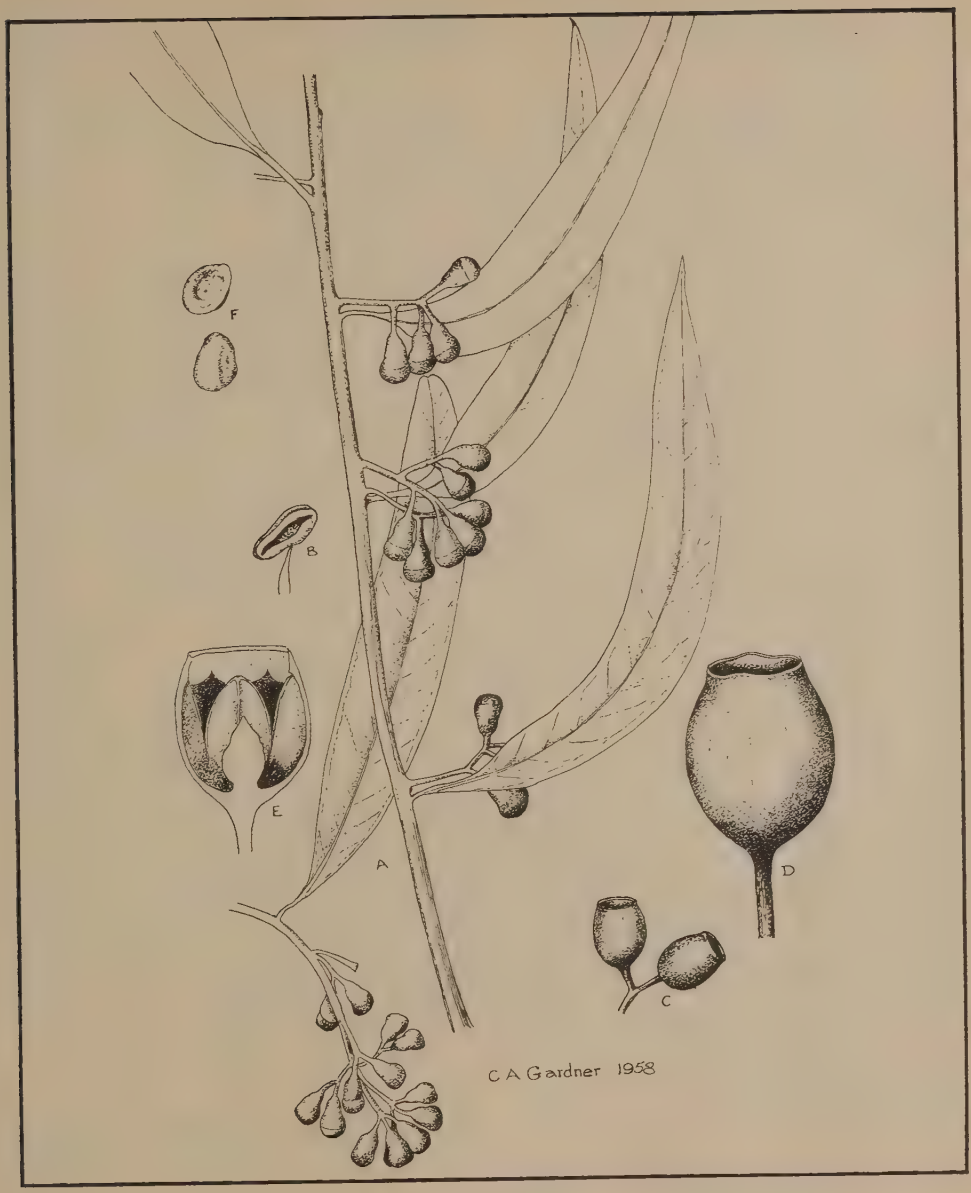
The fruits are also frequently larger than those of the cabbage gum but are of the same texture, and are soon shed. The tree is less common in Kimberley than the cabbage gum, and occurs in sandstone country among rocks from the Artesian Range northward. It is found eastwards to the Ord River, extending into the Northern Territory. This tree could be mistaken for *Eucalyptus Foelscheana* when only in leaf, but a reference to the illustrations of both shows at once the different venation, the veins of *E. Foelscheana* being closer together and much finer than those of *E. grandifolia*.

LARGE-LEAVED CABBAGE GUM

(Eucalyptus grandifolia R. Br. ex Benth.*)*

A—Branchlet with three leaves; B—Flower buds; C—Anther; D—Fruit; E—Fruit in longitudinal section; F—Seeds; G—Cotyledons

[Cockatoo Sands, lower Ord River, *Gardner* 7324]



GHOST GUM

(Eucalyptus papuana F. Muell.*)*

A—Branchlet with leaves and flower buds; B—Anther; C—Fruits; D—Fruit (enlarged); E—Fruit in longitudinal section; F—Seeds

[Derby, *Gardner* 1629]

No. 57—GHOST GUM

(*Eucalyptus papuana* F. Muell.)

THE name "Ghost Gum" although popular in literature, is rarely applied to this tropical tree by bushmen. In Kimberley it is used for structural work to some extent, and commonly known as "Carbeen," a name more properly given to *Eucalyptus tessellaris* in Eastern Australia.

It is found mainly on the alluvial river flats subject to periodic inundation, but it is also fairly common around Derby. This tree attains a height of 50 to 70 ft. with a trunk up to 18 ft. long and 2 ft. in diameter. The bark is smooth and white with a satin-like lustre, and this latter characteristic renders the trees very prominent against green foliage, or in moonlight.

The timber is a pale red, dense and rather hard, but is subject to the ravages of termites. The branches are widely-spreading, the branchlets droop or are quite pendulous, and the leaves are a deep lustrous green, adding to the attractive appearance of the tree.

The flowers and fruits are much like those of the two preceding species, being of the same shape and thin texture, equally short-lived, but smaller, and on somewhat shorter stalks. A broad-leaved form is found near the Macdonnell Ranges, while at Vansittart Bay in North Kimberley there is a smaller tree with a more mottled bark, and sometimes a short collar of tessellated bark at the base. This form grows in sandstone ranges close to the sea. In the Kimberleys the Ghost Gum is found along the Barker, Lennard and Fitzroy rivers, Cygnet and Careening Bays, King Sound and southwards to Broome. It appears to be absent from the Ord River and its tributaries.

No. 58—ROUGH-LEAVED RANGE GUM

(*Eucalyptus aspera* F. Muell.)

THIS species is usually a small crooked tree rarely more than 25 ft. tall, and often much less, growing in dry stony places on tablelands or the sides of hills. It favours arid localities. Originally described from the sandstone country of the upper Victoria River, it has a fairly extensive range in Western Australia, from Mount Barrett on Moola Bulla Station southwards to the Nullagine district and Jigalong.

The largest trees are those seen on the eastern slopes of Mount Barrett, which attain a height of over 20 ft., whereas those further south are frequently less than 12 ft. tall. The bark is white or sometimes rough and tessellated in the lower part with the smooth bark often assuming a pink colour. The leaves are rough and more grey than green; when young they may bear coarse hairs on the stalks, midrib and principal nerves, or even the whole leaf may be hairy, but in the adult stage they are usually rough only, a character to which the species owes the name "aspera."

There is considerable variation in the shape of the leaves. While the northern forms have oblong or ovate, opposite and almost stalkless leaves, in some of the Nullagine forms the leaves of the upper branches may be alternate or opposite, and taper to a rather acute apex. This variability in leaf form is found in all four of the species so far described in this issue, and thus is of limited value in determining the species. It can, however, be readily distinguished from *E. clavigera* (to which it is most closely allied) by the inflorescence which consists of axillary simple umbels on stalks about as long as the buds and fruits. The fruit shape and texture of all four is similar, and is the same as that of the Grey Box (*Eucalyptus tectifica*).

No. 59—WEEPING BOX

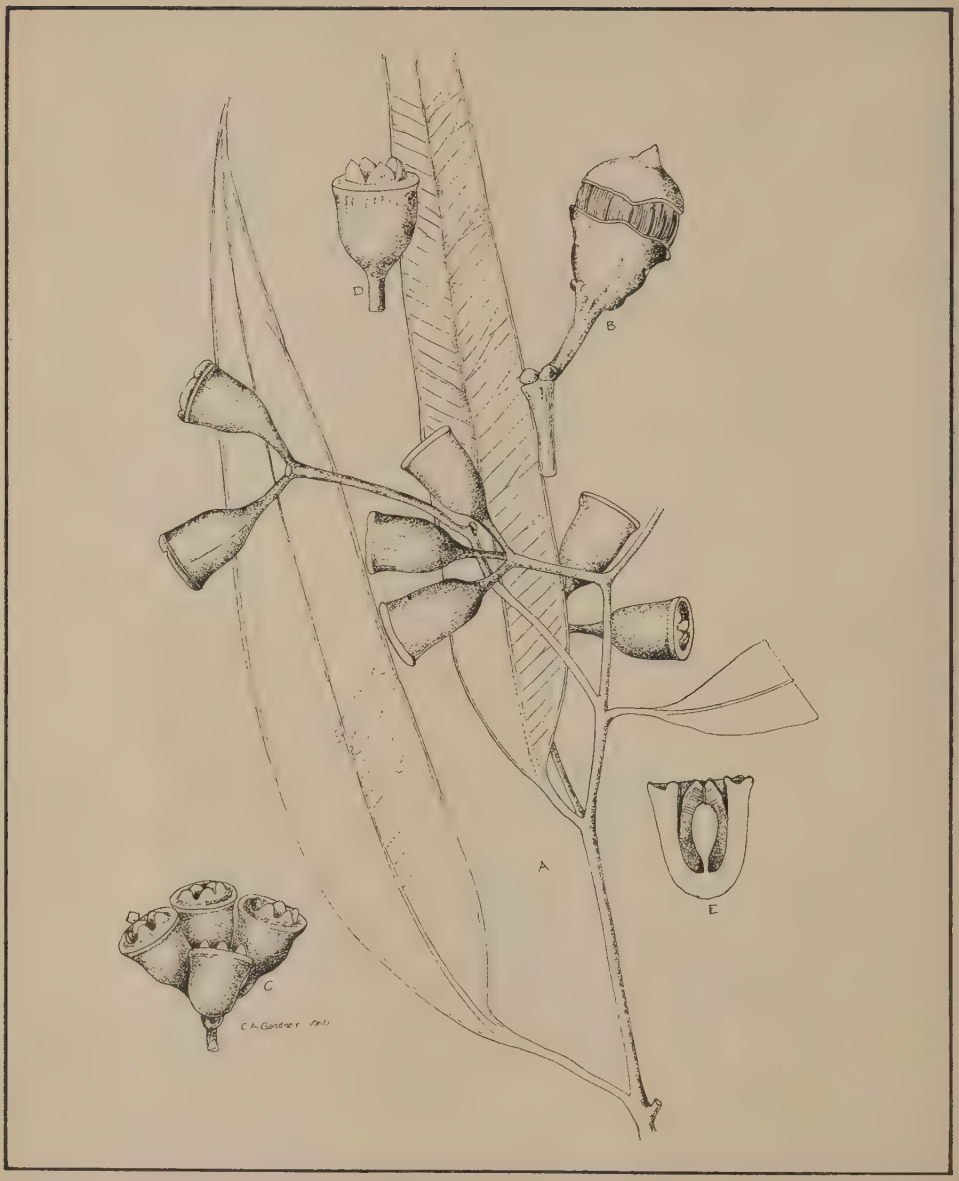
(*Eucalyptus patellaris* F. Muell.)

THIS species is a rough barked "box" tree up to 35 ft. tall, with the grey fibrous bark extending to the ultimate twigs. The foliage is grey-green, and the timber is brown in colour. The fruits are of woody texture with the valves usually shortly protruding.

ROUGH-LEAVED RANGE GUM
(Eucalyptus aspera F. Muell.*)*

A—Leafy branchlet showing opposite sebsessile hairy leaves; B—Axillary inflorescence; C—Anthers; D—Umbel of fruits; E—Fruit enlarged; F—Fruit in longitudinal section; G—Branchlet with alternate narrow pointed leaves; H—Fruits; I—Fruit in section

[A, E, and F Mount Barrett *Gardner* 10200; B, C and D from Flockton, Maiden's Critical Revision of the genus Eucalyptus; G, H. and I, Five Mile Creek, Nullagine, *G. E. Brockway*]



WEEPING BOX

(Eucalyptus patellaris F. Muell.*)*

A—Branchlet with leaves and fruits; B—Flower bud; C—Cluster of fruits; D—Fruit; E.—Section of fruits.

[Near Turner River *Perry* 3200 except B, which is copied from a drawing of a bud from the type specimen—upper Roper River, *Mueller* July, 1856]

SILVER-LEAVED BOX

(Eucalyptus pruinosa Schau.*)*

A—Branchlet with leaves and a terminal panicle of flower buds; B—Flower bud; C—Anthers; D—Branchlet with fruits; E—Fruits; F—Fruit (enlarged); G—Section of fruit; H—Seeds

[All from Bohemia Downs, *Gardner* 7124, except E, from Kimberley Boundary Survey in latitude 190S, *S. J. Stokes*]

Little is known of this tree in Western Australia. It has been collected twice, once by Perry (2414) ten miles southward from the Turner River, and by Gardner on the banks of a watercourse on the upper Ord River at Alice Downs Station.

The accompanying illustration may serve to determine this plant in the field.

No. 60—SILVER-LEAVED BOX

(*Eucalyptus pruinosa* Schau.)

THIS species a a small straggling tree rarely exceeding 18 ft. in height, with a rough grey fibrous bark persistent on the trunk and branches, and a dark red timber. The branches are spreading and somewhat straggling, and the branchlets, leaves and flower buds are white as if frosted. It is sometimes known as "Apple Box" on the Ord River. The name *pruinosa* from the Latin *pruina*, hoar-frost, refers to this frosted appearance of the foliage.

The species is one of those which bear their flowers in umbels which are arranged in panicles (see A), and the foliage is stalkless and indented or stem-clasping at the base. The leaves are always opposite, and the branchlets usually four-angled. The flowers are white, and the fruits, which are hard and somewhat woody, vary from goblet-shaped to almost cylindrical, and the broad valves do not protrude.

This remarkable tree is found in various localities on the lower stretches of the Ord River, usually where limestone is present in the soil. It is also common along the Fitzroy River, especially around Bohemia Downs where it grows in red sand.

No. 61—KIMBERLEY WHITE GUM

(*Eucalyptus Houseana* W. V. Fitzg. ex Maiden.)

THE common tree found along the river flats of the Drysdale, King Edward, Mitchell, Moran, Carson and Glenelg Rivers is *Eucalyptus Houseana*, a tree attaining a height of 60 ft. with erect or spreading branches. The bark is clean throughout and white in colour, smooth and the outer layers shed in large thin plates. The trunk is up to 30 ft. long and 30 in. in diameter, and often swollen at the base as in the common wandoo of the South-West. The timber is pink to red in colour, and the tree appears to be restricted to the sandstone and quartzite formations.

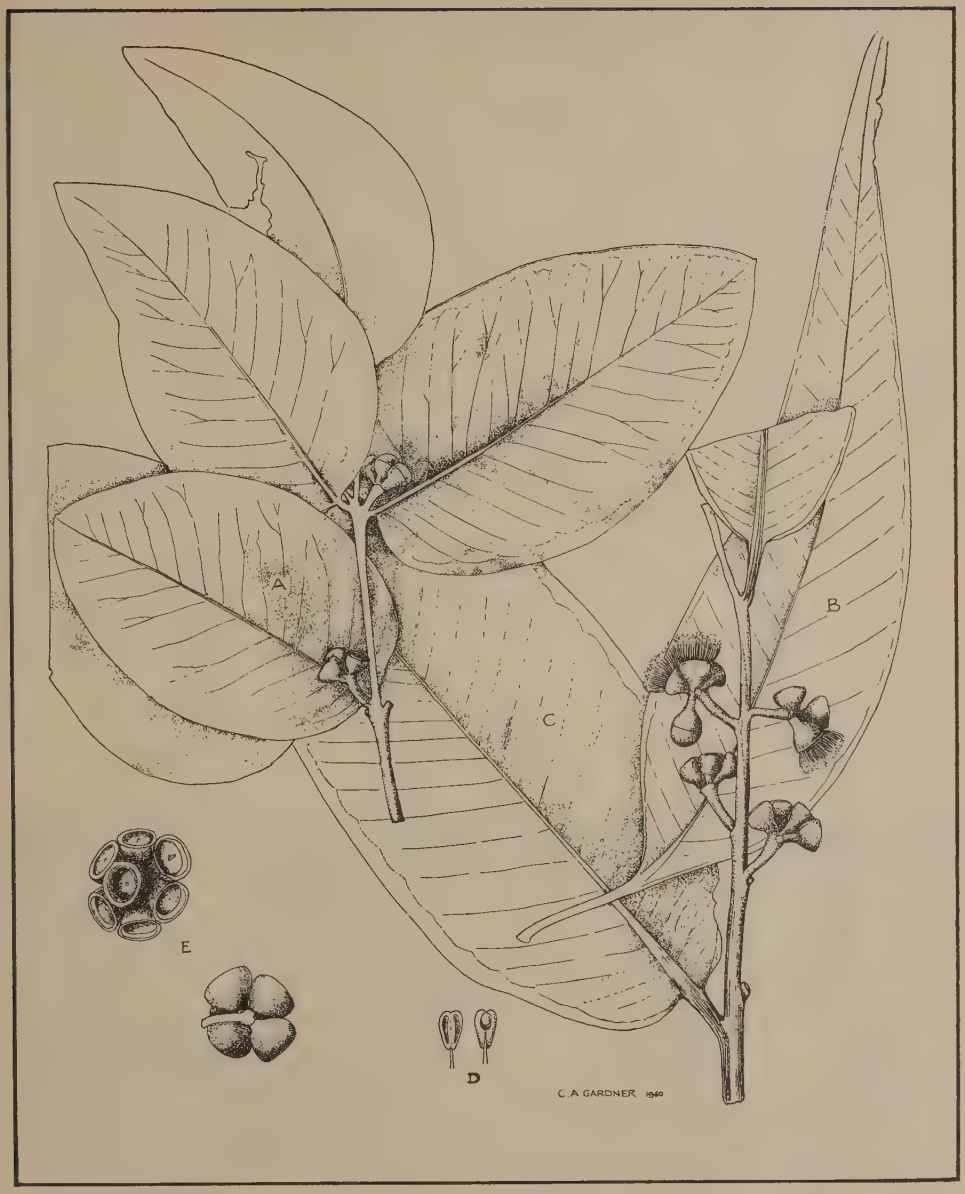
Like a number of tropical Kimberley trees there is considerable variation in the shape of the leaves. A. shows the foliage *Houseana*, from the Isdell River near Mount Barnett homestead. It has practically stalkless, subopposite broad leaves. The form for the Artesian Range (*Fitzgerald 1357*), also the Charnley River (*Gardner*) has narrow-stalked leaves, the leaf-base tapering into the stalk; while the form from the Couchman Range and the Prince Regent River has shortly-stalked, blunt leaves which are broad at the base and quite obtuse or subcordate at the base.

The buds and flowers off all are similar, and the fruits are unknown. *Eucalyptus apodophylla* from the Northern Territory, also from Gibb River in Kimberley is almost certainly only a form of this species. It is unfortunate that this species occurs in such inaccessible country. Until fruits have been found in a ripe condition and further observations made on leaf forms the species will have to remain imperfectly known.

No. 62—POPLAR GUM

(*Eucalyptus bigalerita* F. Muell.)

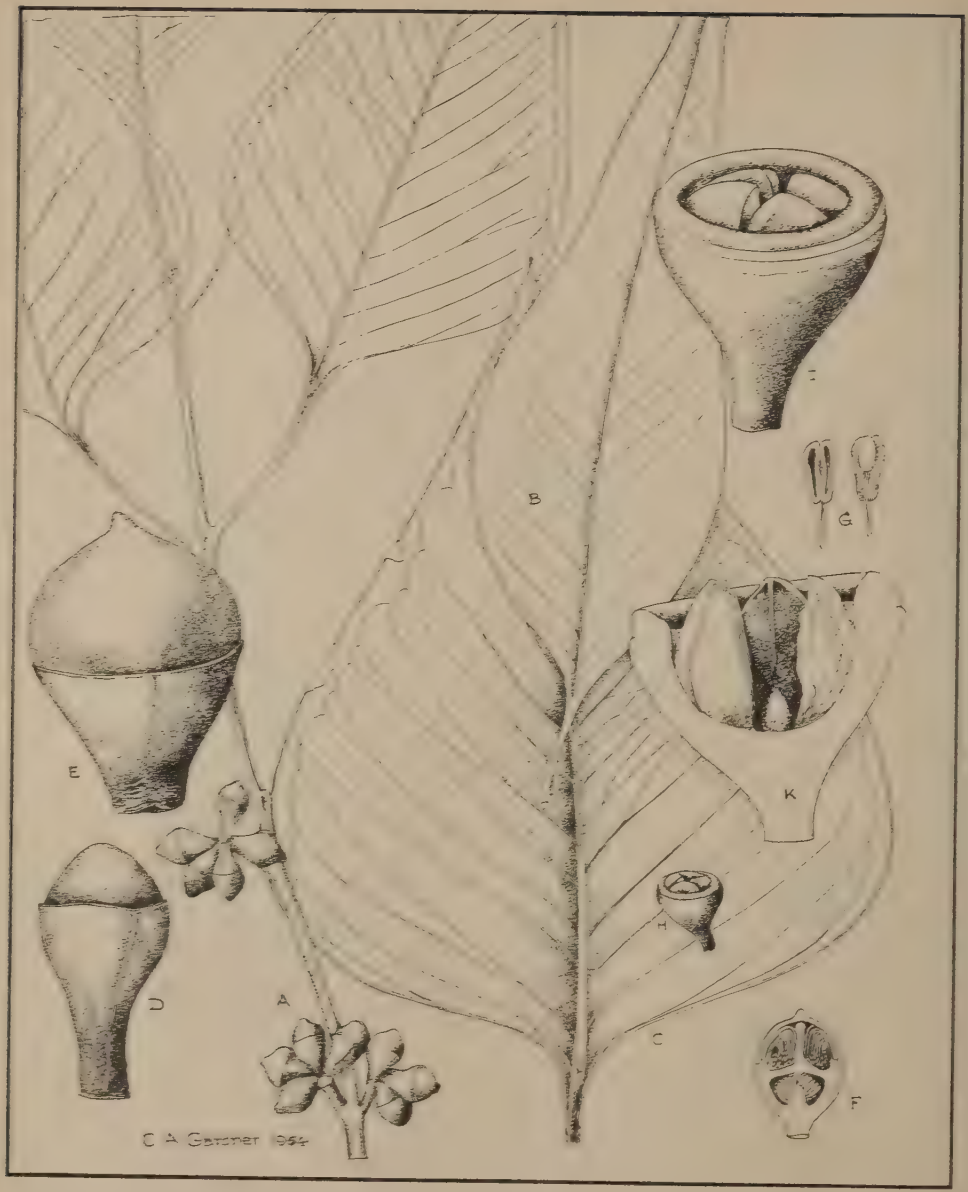
THE Poplar Gum is found in various parts of Kimberley and adjacent Northern Territory, but as far as the writer has observed it in Western Australia it is usually found on alluvial soils which are subject to inundation in summer or for a considerable part of the year. It is



KIMBERLEY WHITE GUM

(Eucalyptus Houseana W. V. Fitzg. ex Maiden.*)*

A—Leaves, flower buds and immature fruits from Isdell River near Mount Barnett homestead, *W. V. Fitzgerald* 1014 (Type); B—Leaf from Artesian Range (*Fitzgerald* 1357); C—Branchlet from watercourses in Couchman Range *(Gardner)*; D—Anthers; E—Clusters of immature fruits, from Couchman Range



POPLAR GUM

(Eucalyptus bigalerita F. Muell.)

A—Branchlet with leaves and buds. B—Narrow leaf. C—Broad leaf. D—Flower bud. E—Flower bud much enlarged. F—Flower bud in section. G—Anthers. H—Fruit, natural size. I—Fruit much enlarged. K—Fruit in longitudinal section

[Lennard River, *Gardner*]

usually found in clay soils, but sometimes also in moist sandy loam (e.g., near Mount Agnes, and on upper Drysdale River near Mount Hann). Its range in Western Australia extends from the lower Ord River to the Barker and Lennard Rivers and their tributaries, but it has not been seen on the Fitzroy River.

The tree attains a height of 35 ft., with a widely-branched crown. The stout trunk is up to 25 ft. long and 16 in. or more in diameter, and the timber is pink or light red. The bark is smooth throughout, varying, according to the season from yellow to pink to pure white, and the outer layers decorticate in large thin plates. The tree is frequently completely deciduous under natural conditions, and another somewhat peculiar feature is that the branches of the same or adjacent trees when coming in contact frequently fuse.

The leaves are almost triangular in shape (see illustration) and a bright yellowish-green in colour, reminding one somewhat of large thick poplar leaves. This fact should be particularly noted with reference to the habitat, for the closely-related *Eucalyptus alba* has leaves which do not possess this distinctive colouring, and are more rounded at the base. Those which I have seen near Katherine grow in sandy loamy soil which would not be inundated in summer. *E. alba,* which has somewhat dull foliage and narrow leaves is usually found on higher land, while *E. bigalerita* which grows in moister low-lying situations has broader lustrous leaves. Since these are the principal differences (excepting for trivialities in the buds and fruits, which are much less than the variations seen in species previously discussed in this issue) some botanists may prefer to regard these as two forms of a single species which would then be called *Eucalyptus alba.*

Spreader Banks for Gullies

The force can be taken out of water running in gullies if spreader banks are used to check the flow of the water. The water must run back into the gully at a safe point or spread out by another spreader bank. Gullies treated this way can be safely filled and stabilised.

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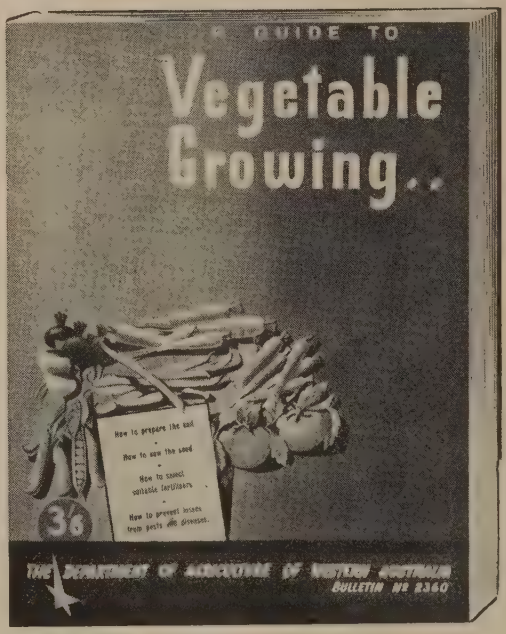
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Messrs. C. R. and A. J. McGlew's Champion Border Leicester ram at the 1959 Perth Royal Show

The Champion Border Leicester ewe at the 1959 Perth Royal Show. This was also exhibited by Messrs. C. R. and A. J. McGlew of "Seaton Ross," Beverley

Famous Sheep Breeds

4.—The Border Leicester

by

J. A. MALLETT

ALTHOUGH the Society of Border Leicester Sheep Breeders was formed only 62 years ago and the first volume of the Border Leicester Flock Book appeared in 1899, surprisingly little authentic information is available concerning the origin of the breed.

It is generally accepted today that the Border Leicester originated from a cross between the Improved English Leicester and the Cheviot. This belief is strengthened by the fact that the Border Leicester head is free from wool to a point behind the ears—a characteristic found in no other British breed except the Cheviot.

When Robert Bakewell of Dishley Grange, Leicestershire inaugurated his revolutionary stock improvement techniques from about 1755 onward, the results he obtained were so dramatically successful that many progressive breeders went to Dishley Grange as pupils.

Among them were Charles and Robert Colling—who later became famous for their work in developing the Shorthorn breed of cattle—and George and Matthew Culley. Both pairs of brothers took back Dishley Leicester sheep to their homes in the north of England where they established studs.

They sold rams and ewes to breeders on both sides of the English-Scottish border and many of the Border flock-owners also purchased stock or hired rams from Bakewell and members of the Dishley Society.

Records of the Highland and Agricultural Society show that up to the year 1868 classes were provided for Leicesters only. From 1869 to 1872 and 1875 to 1881 there were classes for both Leicesters and Border Leicesters but after 1881 the classes were for Border Leicesters only.

CROSSBREEDING

The chief value of the Border Leicester is for crossbreeding with other types of sheep. In Scotland, the rams are crossed with Scottish Blackface and Cheviot ewes to give "Greyface" and "Halfbred" progeny. Greyface and Halfbred ewes are mated with Down rams to produce a good type of butcher's lamb in the same manner that we use the ewe progeny of Border Leicester—Merino crosses to mate with Downs rams for the export lamb market.

The Border Leicester being a thickly-fleshed and easily-fattened animal, transmits these desirable qualities to its progeny, which, in the case of the hill sheep matings, produces an animal with mutton of better quality than that of its sire and in greater quantity than that of its dam.

Although it ranks among the largest of the longwool breeds, the Border Leicester, by reason of its comparatively small head and fine bone, may be safely crossed with the small mountain ewes without causing lambing troubles.

Fig. 1.— Crossbred Border Leicester x Merino ewes at the Avondale Research Station. Such ewes are well suited to the production of high quality export lambs after mating with Southdown rams

LOCAL POPULARITY

In Western Australia, the handsome Border Leicester ram is highly regarded. Numerically, the Border Leicester ranks second only to the Romney Marsh among the longwool breeds. Mated to selected Merino ewes it produces excellent crossbred progeny. The crossbred ewes from Border Leicester x Merino matings are particularly popular among export lamb producers for mating with Southdown or Dorset Horn rams to produce shapely lambs for the overseas market.

Wether lambs from the Border Leicester x Merino matings sell well on the local meat market or may be carried over to produce good crossbred fleeces if the season is not suitable for them to be "finished" as sucker lambs.

The excellent milking qualities of the first-cross Border Leicester-Merino ewes make them particularly suitable for use in the northern and eastern portions of the lamb-raising areas where seasons tend to be short. Their lambs are noted for high growth rates.

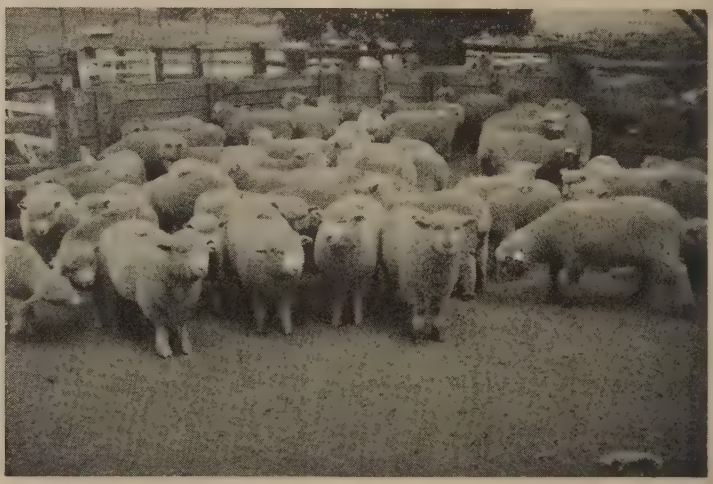

Fig. 2.—Lambs resulting from the mating of Border Leicester x Merino crossbred ewes with Southdown rams

Attempts are being made in Australia and elsewhere to "fix" the Border Leicester-Merino cross and inaugurate a new breed, in a similar manner to that by which the Corriedale was evolved from a Lincoln-Merino cross.

POINTS

Head.—Medium sized; smooth crown; wide in forehead. Full and even down the face to a slightly roman nose perfectly free from wool and covered with pure white, soft hair; occasionally a black spot will appear.

Face.—Strong jaw and clean cut. Nostrils wide and dark.

Eyes.—Full and prominent, but mild and placid, with a quiet, gentle expression.

Ears.—Lively; mobile; medium sized and semi-erect; white inside and out; black spots sometimes appear with age.

Neck.—Tapering nicely from the head, and strongly set in at the shoulders.

Shoulders.—Wide, with plenty of heart room.

Chest.—Broad, deep and well formed.

Back.—Straight, level and broad.

Ribs.—Well sprung in a fine circular arch, more attractive for width than for depth.

Hindquarters.—The loin should be wide and firm, and the quarters long and deep.

Legs.—Squarely set under; strong; with clean, flat bones, covered with perfectly white hair, and quite free from wool.

Skin.—Pink, and mellow to the touch.

Fleece.—Border Leicester wool has a staple eight to nine inches in length with five to seven crimps to the inch, bold-stapled and ranking as a "First Demi-Lustre." The spinning quality is 44/46 and the wool is used for fine serges, coatings and dress fabrics.

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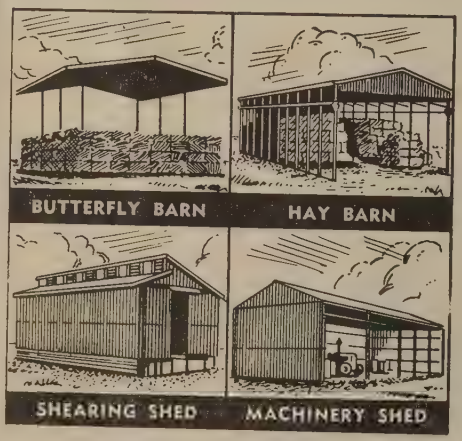

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8.—WEED CONTROL IN THE VINEYARD

By G. A. PEARCE, B.Sc. (Agric.), Adviser, Biological Services Division, and
W. R. JAMIESON, Dip. Oen. (Roseworthy), Viticulturist, Horticultural Division.

WEED control in the vineyard has been achieved by cultivation for many centuries and it is only during recent years that attention has been given to the use of herbicides for this purpose. Today there is little risk to the vine in using any one of the herbicides listed in this article, and in general the main considerations governing the use of chemicals for weed control are the cost of the operation and the effect which it is desired to achieve.

CULTIVATION

Although there are a number of different methods of cultivation the main reasons for this practice are:—

(i) To prepare a seed bed for a cover crop.
(ii) To incorporate the cover crop into the soil.
(iii) To control the growth of weeds.

It can be seen therefore that, if cover crops are used, some cultivation will always be necesary. In this article we are only concerned with the suppression of weed growth. However, any increase in production can only be achieved if the entire soil management programme is satisfactory.

Weeds are any plants growing out of place. When they are growing under the trellis or between the vine rows they compete for moisture and plant nutrients, and in most cases, weeds have very high requirements of both soil moisture and plant food.

STRIP DIGGING

The control of weeds under the trellis by cultivation is not simple, and usually involves the use of a single-furrow offset mouldboard plough known as a vine strip-digging plough. By slicing a single furrow in under the trellis and repeating the operation on the other side the weeds are removed. This calls for skill and experience and even then the roots and trunks of the vines as well as the trellis posts may be severely damaged. This work requires considerable concentration by the operator and even when the plough is mounted on the tractor and operated mechanically, the work is slow and tedious.

EFFECT OF CULTIVATION ON THE SOIL

The control of weeds during the spring and summer is important because of the competition for moisture. Generally, a light cultivation with disc harrows or spring-tooth cultivator with duckfoot tynes is the most economical way to control

annual summer weeds. Under certain soil conditions it may be desirable to use a chemical treatment.

For the control of a perennial grass such as couch, or several successive germinations of pigweed ("never die") a number of cultivations are required. These cultivations may have a disastrous effect on Swan Valley soils.

The damaging effect, on nearly all soil types, of fast heavy tractors and equipment is slowly but surely being established. This damage is greatly increased if the soil is very wet or very dry, as wet soils compact easily and cultivation of dry soil breaks the soil structure and cause the formation of a "hard-pan" at the depth of cultivation. The topsoil loses its organic matter and becomes very sticky when wet.

It is now believed that decline in vineyard productivity can often be associated with the breaking down of the soil structure and the serious loss of organic matter caused by intensive summer tillage.

Cultivation itself does not conserve moisture and its main purpose is to control weeds. The trend now appears to be towards less intensive cultivation and because of this the use of herbicides could become very important.

Fig. 1.—A standard type of strip digging plough with an offset mouldboard

ADVANTAGES OF HERBICIDES.

The main advantages of herbicides over cultural practices are:—

(1) The herbicides discussed here only penetrate the surface layer of the soil and do not have any effect on the soil structure or moisture relationships.

(2) The risk of physical damage to the vine trunk and roots as well as the trellis posts is removed completely.

(3) Chemicals are easier to apply and more efficient than a single cultivation. In many cases it is cheaper to use chemicals, particularly when treating the narrow strip under the vines.

RECOMMENDED TREATMENTS

1. Strip Digging Effect.

Probably the most important use herbicides can be put to in vineyards is to create a bare strip of soil immediately adjacent to the row so that there is no need to strip-dig.

By using C.M.U. at the rate of application recommended, the growth of weeds can be eliminated from the treated area. The disadvantage of strip digging can be overcome while the cost of the treatment is probably reduced.

2. General Spraying.

Although the chemicals mentioned in this article will not affect the vines it is important to consider the residual effect on the soil. Once treated with C.M.U. or

Amitrol for pre-emergence weed control, the soil will not support the growth of a cover crop for some time depending on a number of conditions. For this reason as well as the cost of the chemicals it is more practical to "spot-spray" weeds after they have emerged rather than kill the weed seeds as they germinate.

is to spread the recommended amount of chemical evenly over the given area. Best results are usually obtained if the soil is moist at the time of application—say within a week of the germinating rains.

Normal vineyard spraying equipment can be used to apply the chemicals mentioned, but some care is required to avoid

Fig. 2.—Strip-digging in progress. Note the depth of the furrow and the closeness to the vines making it very easy to cause damage

With perennials such as couch or kikuyu, it is difficult to obtain complete control no matter how often the weeds are cultivated. Using dalapon as recommended, these grasses can be eliminated with two sprayings.

Method of Treatment.

Weedkilling chemicals are normally applied at reasonably low pressures of approximately 50 lb. per square inch. The usual volume applied in vineyards and orchards is from 80 to 150 gallons per acre.

Where absorption is taking place through the leaf or stem, sufficient solution should only be applied to wet the absorbing surface. One hundred gallons per acre is normally required. Any run-off is wasted.

Where it is desired to kill the weed seeds as they germinate, it is essential to obtain an even application of the chemical to a reasonably smooth and clean surface. For this reason a high volume of application of 150 gallons per acre should be used. In this case the most important requirement

contamination. Although these chemicals have not the same residual dangers as the hormone sprays, such as 2,4-D, the equipment, including the vat and hoses, should be thoroughly washed out after use.

Spraying the foliage of the vines should be avoided as much as possible because the actual leaves treated will be affected. By reducing the pressure of the spray unit to 50 lb. or less per square inch the damage of spray drift will be greatly reduced.

The addition of a wetting agent, such as a household detergent, to the spray solutions aids in the absorption of the herbicide into the plant.

SUITABLE CHEMICALS

The chemicals listed, when applied to weeds in a vineyard, will not damage the vines if used at the rate recommended and provided the solution is not sprayed directly onto the foliage.

These herbicides are not toxic but are harmful to all garden plants.

1. **C.M.U.** (Chlorophenyl dimethylurea).

C.M.U. has proved to be very effective for the control of annual weeds when applied before or soon after germination.

C.M.U. is recommended as a treatment which can replace the practice of strip digging. The recommended rate of application is two pounds of 80 per cent. C.M.U. in 150 gallons of water per acre. This means that 1 oz. dissolved in 5 gallons of water is sufficient to treat a strip 18 in. wide and 13 chains long. In this case 9 in. on each side of the vine row would be sprayed. The idea is to apply a thin film of the chemical evenly over the surface, and this will be washed slowly into the top few inches by the rain and kill the weed seeds as they germinate. For this reason it is essential to clear the surface of all trash and level the area to be treated as much as possible. C.M.U. is not highly soluble and it is important to keep the mixture well agitated.

Fig. 3.—Two pounds C.M.U. per acre 14 weeks after the treatment was applied. No weeds appeared on plots receiving this treatment during the past year

For the control of summer growing annuals such as crabgrass or pigweed ("never-die") in irrigated vineyards, the rate of application should be increased to 4 lb. C.M.U. per acre. (Two oz. in 5 gallons of water per 150 square yards). Best results will be obtained if the chemical is applied to the soil while the surface is still damp and before the weeds become too large. This treatment is very costly over large areas and in most cases it would be more economical to spot-spray affected areas.

2. **Dalapon** (Sodium dichloropropionate).

This chemical is a selective grass weedkiller and has proved very effective against couch and kikuyu. The rate of application for vineyards should be 10 lb. of 85 per cent. dalapon per acre. This means that when only applying sufficient solution to wet the leaves, without run-off, a suitable solution is made by dissolving 1 oz. of dalapon in each gallon of water. A second treatment should be applied 10 to 14 days after the initial application.

For the control of winter and summer growing annual grasses the rate of application should be reduced to 5 lb. of dalapon per acre. This means that a suitable solution is made by dissolving one half ounce of dalapon in each gallon of water.

It should be remembered that dalapon is absorbed through the leaf of the grass and best results are obtained if the treatment is applied when the weed is making active growth.

3. **Amitrol** (Amino triazole).

Amitrol is a general purpose weedkiller which can be used in a number of ways. Although initially it appeared to be as effective as C.M.U. for the pre-emergence

control of annual weeds, in trials last year C.M.U. proved more effective.

Amitrol is probably the most effective chemical for controlling heavy weed growth in vineyards during the spring.

For the control of weeds shortly after emergence the recommended rate is 10 lb. of 50 per cent. amitrol per acre while for heavy spring growth the rate of application should be doubled.

Fig. 4.—Ten pounds 50% Amino triazole per acre 14 weeks after the treatment was applied. Although initially this treatment appeared as effective as C.M.U. during the second year the results were not as good

Fig. 5.—Four times the recommended rate of application of C.M.U. Even at this high level no damage was caused to the vines

4. **P.C.P.** (Pentachlorphenol).

P.C.P. is a contact herbicide which can be used for the control of annual weeds in vineyards. The recommended rate of application is 10 lb. of active ingredient per acre. This means that a suitable solution is made by dissolving 7 fluid oz. of 15 per cent. P.C.P. in each gallon of water. P.C.P. has the advantage of having very little residual effect on the soil.

A WARNING CONCERNING 2,4-D.

Although 2,4-D is the most widely used herbicide throughout the world, it is so harmful to vines that vignerons are advised not to store it on their properties even when they intend using it away from the vineyard.

Although the symptoms of 2,4-D damage are quite obvious it is often very difficult to trace the cause of the damage. The usual ways in which damage is caused to vines are:—

1. Spray Drift.

Even on an apparently still day, spray can drift some distance, particularly where the spraying pressure is high. Because of this, spraying with 2,4-D should not be undertaken in the vicinity of a vineyard.

Fig. 6. — Typical 2,4-D damage (left) compared with a normal runner (right)

2. Vaporisation.

The ester derivative of 2,4-D which is the most common type used, is quite volatile and, with higher temperatures, vapour may be formed. This vapour can arise from the sprayed area but more often comes from contaminated spray equipment stored in the vicinity of the vine.

3. Contaminated Equipment.

Once a spray unit with plastic or rubber fittings and hoses is used for applying 2,4-D, it is virtually impossible to remove all traces of the herbicide from the equipment. Growers should be particularly careful when borrowing or hiring spray equipment and should ensure that it has not been used for applying hormone-like herbicides.

4. Contaminated Chemicals.

Otherwise harmless pesticides have occasionally been found to be contaminated with a harmful herbicide. Although cases have been known where this contamination occurred during manufacture, it usually happens during storage.

5. Aerial Spraying.

Aircraft spraying crops for the control of weeds operate over a large area when turning and flying to and from the landing strip. In this way damage has been caused to other susceptible crops. It is fortunate that very little aerial spraying for weed control is undertaken in the vine-growing areas.

COST OF TREATMENT

1. Strip Digging Effect.

The cost of treating a strip of ground along a row of vines will naturally depend on the width. Experienced vignerons

would have no difficulty in cultivating to within 9 in. of the vine row. It is therefore suggested that the width of the strip to be treated should be 18 in.—9 in. on each side of the vine row.

Using 2 lb. of 80 per cent. C.M.U. per acre, the cost of the chemical for treating a strip 18 in. wide and 10 chains long would be approximately 2s.

2. General Spraying.

Because of the cost of the chemicals discussed, it would not be economical to treat a whole vineyard for pre-emergence weed control for the summer period. Nor would this be particularly desirable because of the effect of the chemicals on winter cover crops. The cost of spot spraying will naturally depend on the density of the plants over a given area.

Using amitrol at the rate of 10 lb. per acre, it would cost approximately £9 for 100 gallons of mixture and this would treat one acre completely covered with weeds. C.M.U. at 2 lb. per acre would cost £4 10s. per acre. The cost of dalapon for the control of perennial grasses would be £9 per complete acre of grass for each treatment. However with these perennials it is most unusual to have large areas infested, and spot spraying isolated patches is most economical.

TABLE 1

Weed	Time for Spraying	Chemical to Use	Rate	Comments
Perennial Grasses, *e.g.*, couch, kikuyu	When making active growth	Dalapon 85%	1 oz. per gal.	Second application 10 to 14 days later. Spray regrowth as it appears.
Annual Grasses, *e.g.*, spear, brome, veldt	Before emergence—within 7 days of germinating rains	C.M.U. 80%	1 oz. per 5 gals.	Apply to smooth bare soil surface.
	After general emergence	Dalapon 85%	½ oz. per gal.	Spray when young.
Winter Broad-leaved Weeds and Grasses	Before emergence—within 7 days of germinating rains	C.M.U. 80%	1 oz. per 5 gals.	Apply to smooth, bare soil surface.
	After general emergence	C.M.U. 80% or	1 oz. per 3 gals.	Spray when young.
		Amitrol 50%	1½ oz. per gal.....	
	Heavy growth	Amitrol 50%	3 oz. per gal.	Spray to wet leaves completely but without run-off.
Pigweed (never die)	Before or after emergence	C.M.U. 80%	1 oz. per 3 gals.	For pre-emergence apply when soil is moist.
Crabgrass	Before emergence	C.M.U. 80%	1 oz. per 3 gals.	Apply when soil is moist.
	After emergence .. .	Dalapon 85% ...	½ oz. per gal.	Apply when young.
Fathen, Nightshade	After general emergence	Amitrol 50%	1½ oz. per gal.....	Spray to wet leaves completely but without run-off.
	Heavy growth	Amitrol 50%	3 oz. per gal.	

Table 1 lists some of the more common weeds found in vineyards and the chemical recommended for their control. After selecting the herbicide to use, reference should be made to that part of the text detailing the use of the particular chemical.

TABLE 2
AVAILABLE CHEMICALS

Chemical	Trade Name	Distributor	Concentration
Dalapon	Basfapon	Henry York & Co. Ltd.	85%
	Dowpon	Agricultural Products Co.	85%
		Barrow Linton & Co. Ltd.	
		David Gray & Co. Ltd.	
		Elder Smith & Co. Ltd.	
		Horticultural Industries Pty. Ltd.	
		Kwinana Chemical Co.	
		Lanes Pty. Ltd.	
		Terra Trading Co.	
		Westralian Farmers' Co-op.	
		Wilcox Moffiin Ltd.	
C.M.U.	David Gray's C.M.U.	David Gray & Co. Ltd.	80%
	Telvar	Lanes Pty. Ltd.	80%
	Terra C.M.U.	Terra Trading Co.	80%
Amitrol	Weedazol	Barrow Linton & Co. Ltd.	50%
P.C.P.	Nocweed P.C.P.	Lanes Pty. Ltd.	25%
	Shell Weedkiller Q	Shell Chemical Co.	15%
	Pentacide	Kwinana Chemical Co.	20%

Table 2 shows the proprietary lines of the chemicals discussed and the distributors known to the Department of Agriculture. All chemicals are powders except the P.C.P.

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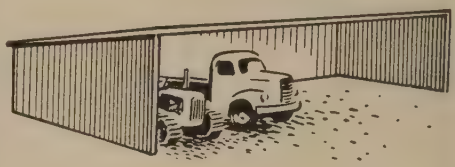

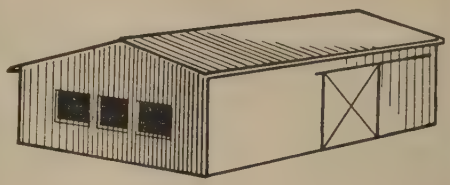

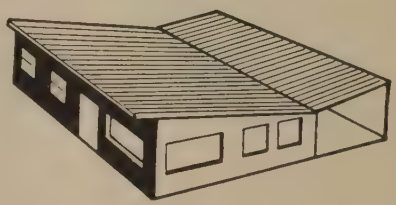

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WILD LIFE

In a Modern Age

By C. F. H. JENKINS, M.A., Government Entomologist

THE present human population of the earth is estimated at about 2½ thousand million, and reliable sources consider that this figure will be doubled by the year 2000. Although the pessimistic forecasts of Malthus have not yet come true, it is obvious that the world's food requirements, must lead to increased exploitation of land and other primary resources, with consequent repercussions on all forms of wild life.

In a country like Australia, which is only just emerging from the pioneering era, wild life and timber are still often regarded as expendable assets. But the older countries of the world are painfully aware of their earlier mistakes and are making strenous, but only too often futile efforts to retrieve the situation.

RECKLESS SLAUGHTER

It is not so many years ago, that the African elephant was slaughtered by the thousand, merely for its tusks, or that the American bison was almost wiped from the prairies by irresponsible hunters.

The history of sealing is perhaps the blackest in the annals of animal exploitation, for only drastic action saved the fur seal from complete extermination, and some of the atrocities perpetrated by the sealers must have been inspired by the Spanish Inquisition. There are records of the sealers skinning the pups alive so that the writhing of the creatures would speed up the operation.

Even the quaint penguins were coveted for their oil, and at one sealing station they were herded up specially-prepared ramps and forced to jump into the boiling-down pots. The islands in the Bass Strait were Australia's first main sealing grounds, and seal skins and oil were her first worthwhile exports. Some idea of the numbers of seals taken, can be gauged from the fact that single ships took cargoes of up to 100,000 skins, with the result that as early as 1830 many of the best sealing grounds had already been ruined.

VICTIMS OF FASHION

On a par with the sealers may be classed the plume hunters, who not so many years ago sacrificed birds of paradise, egrets, lyrebirds and many other species on the

Fig. 1.—The wedge-tailed eagle. A magnificent bird whose record as a lamb-killer has kept it on the "not protected" list

altar of fashion. In the early years of this century, bird plumes supported a flourishing trade; 180 lyrebird tails were offered at one London market, and 50,000 tern wings, and 12,000 bird of paradise skins at another. On one American lake there were 30 camps of professional killers and skinners, engaged solely in taking grebes or dabchicks—the skins were collected in waggons every three weeks. Hundreds of tons of ducks were also killed, merely for the green wing feathers, the bodies being thrown away.

It is not surprising that a violent reaction set in to this wholesale slaughter, and in most civilised countries trading in bird plumes is now completely banned. The reaction was so violent in some instances however, as to lose all sense of proportion, and even scientific collecting came under severe censure. Indeed, at the present time, some Australian States control the issue of collectors' permits so strictly, that many overseas museums have been forced to greatly restrict their work on the Australian fauna.

EXAGGERATED PROPAGANDA

Just how grossly the activities of such foreign expeditions can be distorted, is illustrated by the following extract from a collective publication entitled "Save Australia, A Plea for the Right Use of Our Flora and Fauna," published in Melborne in 1925. The comments are by the late W. Catton Grasby who wrote as follows:—

> Western Australia, being a huge, undeveloped territory with a unique flora and fauna, furnished a happy hunting ground for collectors, and has suffered considerably from the depredations of commercial vandals masquerading under the banner of Science. Up to the time of the Great War the State was visited by various pretentious German and other European "Scientific Expeditions," which were granted privileges to "collect" or in other words endeavour to exterminate the rarest of our animals in the name of Science. Was there ever a greater

Fig. 2.—The black swan is fully protected throughout the State

mockery? It must be admitted, in fairness, that they added considerably to our knowledge, while doing their best to leave nothing behind to enable future investigators to check their statements and conclusions.

The German expedition referred to was the Hamburg expedition of 1905, and while its collecting activities had no detrimental effects whatever on any of the native fauna, its published reports contain some of the most important scientific information available even today, on many of our local creatures.

PROTECTIVE LEGISLATION

One of the direct results of this period of wild life exploitation was the widespread revision of game laws, and the drafting of both national and international legislation to conserve wild life. In the international field, we have conventions governing the taking of seals and whales, as well as the anti-pollution regulations covering the discharge of waste oil and its hazard to sea birds.

International agreements are always subject to various stresses and strains however, and the Antarctic and Australian whaling industries may yet be jeopardised on this account. As far as our native land animals are concerned, most of them are totally protected by law. In Western Australia for instance, indigenous fauna, including mammals, birds, lizards and even snakes are protected, an exception being made of various pest species.

BAN ON EXPORTS

A recent step welcomed by all nature conservationists was the decision of the Commonwealth Government to prohibit the export of native fauna for commercial purposes. This will undoubtedly reduce the pressure on many rare species, but will leave a number of anomalies. For instance, many people will find it difficult to understand why kangaroos and emus may be slaughtered in thousands for a bonus, while they may not be sold alive overseas. But even these pests should be subject to constant review and not be dealt with by rule of thumb methods. A bonus on emus in the eastern wheatbelt may be very necessary, but similar action in all parts of the South-West would be quite unreasonable, and this has, in fact, been recognised, following various protests at the original State-wide vermin declaration.

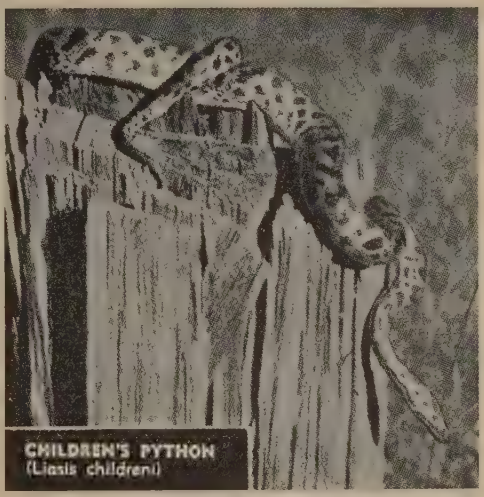

Fig. 3.—This small python subsists largely on mice and is one of the protected snakes

One thing to be learnt from overseas experience is that high animal populations do not necessarily mean long-term security for the species.

In 1801, an eye-witness referring to the migration of the American bison wrote as follows:—

> The ground was covered at every point of the compass, as far as the eye could reach, and every animal was in motion.

Yet a hundred years later, the bison survived only as a small herd in a national park. The fate of the passenger pigeon was ever more tragic. In 1869 a single town in Michigan marketed 15¼ million birds, in two months, while another city sold nearly 12 million in 40 days, but by the turn of the century, the species had vanished from the earth like the great auk and the dodo.

THE LOCAL OUTLOOK

Now what is the present position in Western Australia? A great deal of our local fauna and flora is protected by law, but unfortunately, this type of protection is insufficient in itself to preserve rare forms of life. As we have seen, there is

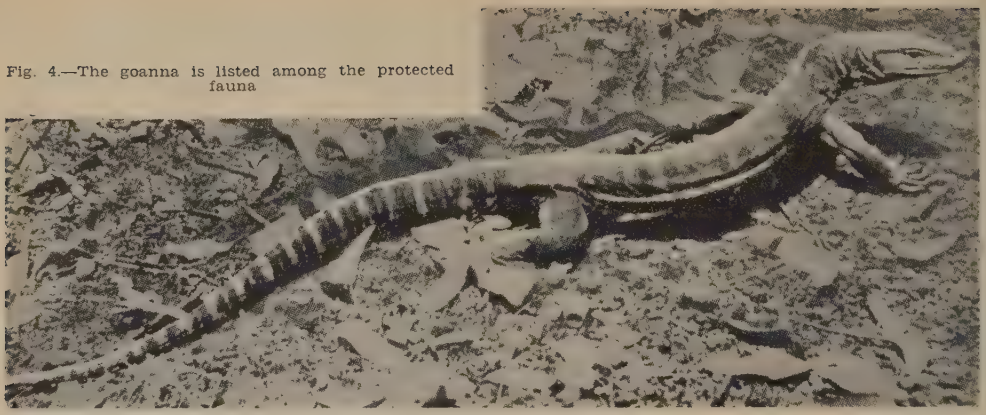

Fig. 4.—The goanna is listed among the protected fauna

a strong tendency in any young country to clear large areas as quickly as possible, and to presume that the wild life is quite capable of looking after itself. The fallacy of such a procedure is already obvious, for animals like the dalgite, the numbat and the quokka have disappeared from many districts and birds like the wild turkey and the mallee fowl are all too rare.

It is, of course, not so much the persecution of individual species which causes the decline in numbers, as the destruction of the habitat or natural surroundings. Such destruction is part and parcel of most agricultural development, and has taken place in all the older countries of the world. Therefore, we should profit by the experience of others, and not persist in learning the hard way.

OVERSEAS EFFORTS

Countries like Great Britain, America and Africa have been greatly concerned at the depletion of their wild life, and have made strenuous efforts to stem the tide.

Perhaps the most progressive step, was the creation of the Nature Conservancy in Great Britain in March 1949. The necessity for some such authority, to counter the despoiling effects of modern industry and agriculture, will be very apparent from the fact that the British coal mines alone, in disposing of 40 million tons of waste, obliterate some 1,000 acres of land every year. Legislation empowers the Nature Conservancy to purchase, or compulsorily acquire land, for nature reserves, and to prevent action on other land likely to be detrimental to wild life. Even in a small area like the British Isles, hundreds of thousands of acres, have been set aside as nature sanctuaries—the various reserves differing in size from the 40,000-acre Cairngorm Mountains, to the 22-acre islet of Grassholm, with its seabird rookeries.

A unique, and widely publicised British reserve, is that run by the Wildfowl Trust at Slimbridge on the River Severn. With an annual income, from donations and fees of £40,000 this reserve has accommodated 149 different species of ducks, geese and swans, and is visited each winter by a number of European bird migrants. More than 100,000 people, including Her Majesty the Queen, have visited Slimbridge in a season, but observation posts are so situated that the wildfowl are quite undisturbed.

The largest nature reserves so far constituted, are in America and Africa, and perhaps the best known is the Kruger National Park of over 7,300 square miles.

The Aleutian Islands National Wild Life Refuge is somewhat smaller, but this covers 4,250 square miles, and is larger than the island of Cyprus.

Extensive areas in Western Australia have been gazetted from time to time as national parks and flora and fauna reserves, but their usefulness has been mitigated by lack of supervision, public apathy, and widespread ignorance of the principles involved. For instance, in the metropolitan area, river foreshores, and

suburban lakes are bird sanctuaries, where shooting is prohibited, but such restrictions have no effect on dredges and bulldozers, and these, can do more permanent damage to a bird population in one day, than a whole season's shooting.

Many of the overseas reserves, are carefully controlled by rangers, and access by the public may be restricted or even totally prohibited. For instance, 55 square miles, known as the Sespe Wildlife Preserve in California, has been set aside in an effort to save the largest of all flying birds, the

Fig. 5.—The Australian bustard or "wild turkey" is fully protected throughout the State

condor. Even oil drillers and bird watchers are excluded from the area which is said to hold the last 60 condors existing in North America.

THE TOURIST ANGLE

It is quite fashionable at the present time to talk about the tourist potential of Western Australia, and to emphasise the various scenic attractions and our unique flora and fauna.

It is worth remembering however, that over the past 20 years, 12 million acres of land have been developed for agriculture in this State, and that the rate of development shows no sign of slackening. This may augur well for our economic future, but it could spell disaster for our wild life and make a mockery of our claim to many scenic features and tourist attractions.

There is nothing attractive or scenic about treeless rivers, shadeless roads and cleared paddocks. Obviously the march of progress can't be stopped, but its impact can be cushioned by appropriate action. The destruction of trees along watercourses and roadsides should be reduced to a minimum and suitable tracts of land should be preserved as nature reserves in various parts of the State. These areas must be really extensive, to serve any useful purpose, and their establishment must be based on a co-ordinated long-term policy, and not on the whims of some interested pressure group or rate-hungry local authority.

A stirring of the public conscience along these lines is already evident in the activities of such organisations as the Tree Society, The National Trust, The Royal Society, The Naturalists' Club and the Gould League of Bird Lovers. We have helpful legislation and some very fine parks and sanctuaries. Many more are needed however, to ensure that future tourists will actually see the things of which we now boast and not be forced to read about them in history books.

Honey Flora Calendar for May

COMPILED BY R. S. COLEMAN, APICULTURAL SECTION, WITH ASSISTANCE FROM THE BOTANICAL BRANCH

Common Name	Botanical Name	Where Found	Honey		Quality of Pollen	Remarks
			Quality	Quantity		
Karri	*E. diversicolor* F. Muell.	Southern Coast, Denmark-Walpole, Albany	Choice	Excellent	Poor	Flowers through winter. Bees store some honey, depending upon weather.
Lustre-leaved Mallee	*E. foecunda* Schau.	North of Dongara	Unknown	One report good	Unknown	This could be a good future honey plant.
Bullich	*E. megacarpa*	Associated with coastal Karri	Choice	Good	Good	A good build-up for Karri. Too scattered to be dependable.
Swamp Yate or Flat-topped Yate	*E. occidentalis* Endl.	Throughout Great Southern and along south coast	Choice	Poor to good reports	Unknown	Uncertain yielder, as it is attacked by parasites and flow is often interrupted by rain. Usually flowers every year.
White Gum or Wandoo	*E. redunca* Schau. vars. *elata* Benth.	Winter flowering Wandoo found from Chittering north-west to Moora	Excellent	Excellent	Excellent	Tends to flower in the valleys. Major honey plant. Very little budded to flower this year.
Hooked Mallee	*E. uncinata* Turcz.	Mallee areas. Esperance to Geraldton	Very little known in Western Australia. Victoria and South Australia regarded as excellent	Good in South Australia and Victoria	Good in South Australia and Victoria	Not worked enough in Western Australia.
Mothers' Bells	*L. concinnus* Benth.	On poor sands of coastal area	Poor	Good	Good	This plant seems to be uncertain in its growth, but good flows have been reported.

White Bell	*L. conostephioides*	Poor sands, generally associated with Menzies Banksia	Good	Good	Good	Importance of this plant is its time of flowering, producing when there is little else. Rain does not penetrate the flower and the nectar is not diluted.
White Heath	*L. propinquus* R. Br.	Poor sands throughout wetter portion of State, inland as far as Narrogin	Good	Good	Good	Importance of this plant is its time of flowering, producing when there is little else. Rain does not penetrate the flower and the nectar is not diluted.
	B. candolleana	Midlands area, Moora	Good	Good	Good	Very scattered and difficult to find enough.
Holly Leaf Banksia	*B. ilicifolia* R.Br.	Low areas but not swamp in coastal plain	Unknown	Uncertain	Good	Long flowering.
Menzies' Banksia	*B. Menziesii* R.Br.	Coastal sand plain	Good	Poor to good	Unknown	Grows in association with other honey-producing plants. Keeps "brood raising" going.
Acorn or Silver or Orange Banksia	*B. prionotes*	Coastal and sand plain area	Poor	Poor to good	Good	Differing views held on this Banksia. Probably a good producer in some areas. Main fault is that tight cones trap bees.
Fox Banksia	*B. sphaerocarpa*	Widespread	Poor	Poor	Unknown	Often in area where bees build up. Could contribute to build up.
Kerosene Bush	*D. Ashbyi* B. L. Burtt	North of Dongara	First quality	Good	Good	Found on ironstone outcrops and sandstone. Likes clay soil and gravelly soils best. Produces a fortnight after the opening rains.
	D. Fraseri R.Br	Wagin, Narrogin main area to Dongara and south in White Gums	Doubtful	Doubtful	Good	This plant is similar to *D. Ashbyi* but more information would be welcomed.
Death Flower	*C. sanguineus* Lahill	Widespread, seems to like rocky slopes, either limestone or ironstone	Good	Good	Good	Flowers over a long period.
	H. scoparia Meison	Midlands, Coorow-Moora	Good	Good	Good	Good flow, sensitive to frosts. Worked when nectar is thick.

It will be seen from this list that information concerning many nectar-bearing plants is far from adequate. We would appreciate further information from beekeepers

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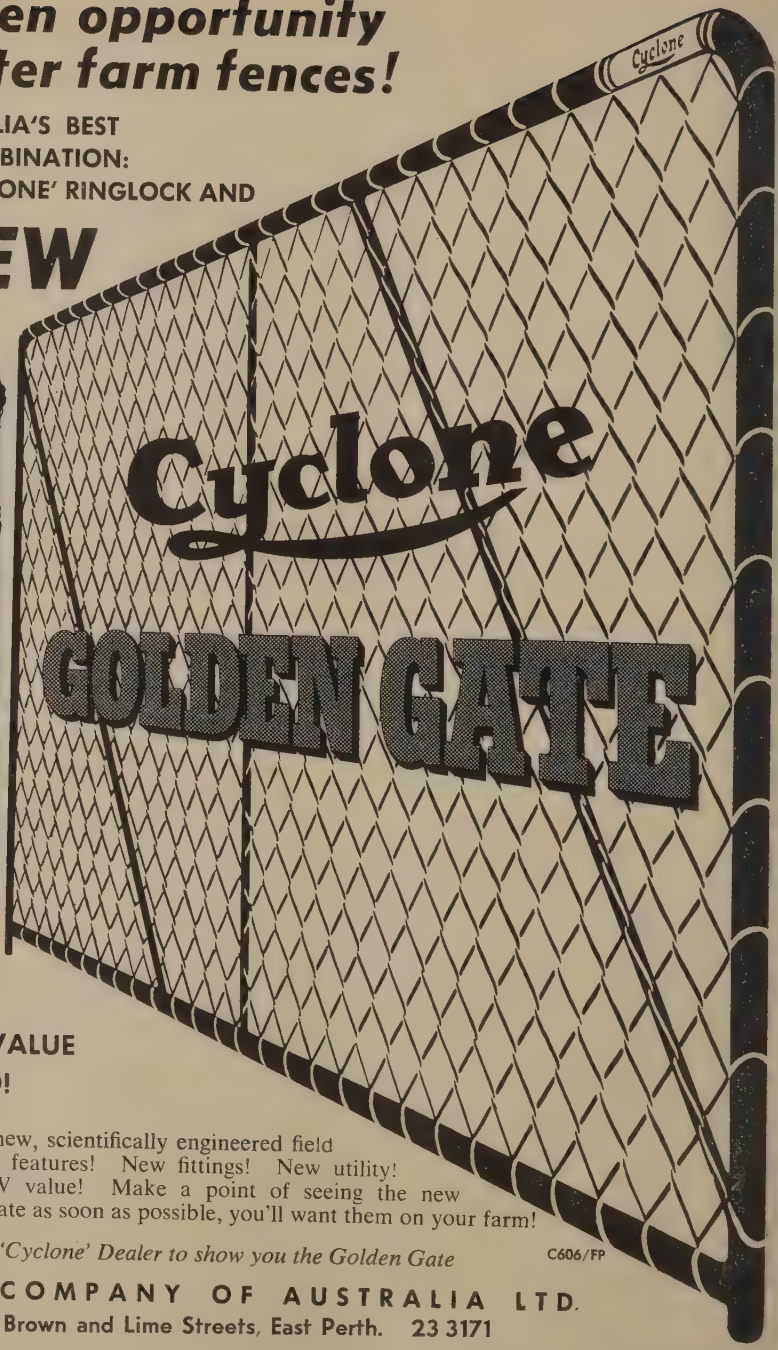

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DEFERRED GRAZING

What it May Mean in the Mulga Region

By W. M. NUNN, B.Sc. (Agric.), Officer-in-Charge, North-West Branch

THE practice of deferred grazing has been written up in American textbooks and has been applied effectively to sections of the cattle range lands of the United States. Early attempts to apply the principle in eastern Australia were not very successful, and it remained for our Departmental workers in the North-West and Kimberley Divisions to demonstrate the phenomenal results that could be obtained on grasslands in summer rainfall areas.

Briefly, the term "deferred grazing" means that the stock are held off the area in question for a period after rain, to enable grasses to make root and leaf growth and to set seed. In northern areas of summer rainfall all this can be achieved in about six weeks, so deferment is as simple as it sounds and means exactly what it says. The grazing of the paddock being favoured is deferred, or delayed for six weeks, and apart from this, grazing goes on as usual except that there are more and more grass species developing as a result of the protection during the critical growth period.

This has been written up quite extensively as a Departmental recommendation for certain of our pastoral areas, but there is a tremendous area of pastoral country throughout the Gascoyne, Murchison and Eastern Goldfields, where the picture is not so simple. Here the rains can fall in summer or in winter. A good year might produce falls in both seasons but there can also be a run of bad years, when both summer and winter rains fail.

Grasses grow in sections of this country, but though they are closely related to those further north, they do not behave so obligingly. In other words they do not mature and set seed in that short six-week period. Summer rains will often keep the grasses growing vegetatively and delay the tendency to produce seed until much later, when they suddenly produce seed as a response to a winter rain. Thus,

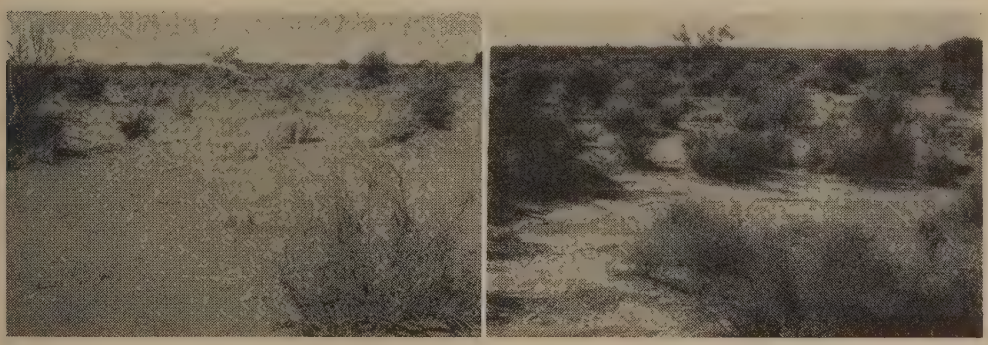

Fig. 1.—Saltbush trials on Barnong Station. On the left is a photograph taken in March, 1952. On the right is the same area (Site A42) photographed in May, 1959. Rains in 1953 germinated seed and initiated seedling growth. Protection from grazing in subsequent seasons enabled the seedlings to develop

to get the same effective cycle of seed multiplication as is achieved in six weeks further north, it might be necessary to spell throughout the summer while the plant develops, and then continue until a later rain induces the plant to produce the seed so badly needed.

The same country which produces these grasses also produces a host of edible shrubs—*Acacia* and *Eremophila* species. Opinion varies as to which are the most important of these and how they rank in relation to grasses, and there is a whole field of study required here to determine just what type of protection these valuable species need to enable them to compete again with the inedible plants which have invaded while the sheep and kangaroos have kept down competition for them.

Fig. 2.—A dense stand of Wandarrie grasses in the mulga clearing experiment enclosure at Albion Downs Station

Obviously a recovery programme must be planned in relation to rains received, and as different species respond in different seasons it calls for a thorough understanding of a more complex picture than that we have been able to present for the Northern summer rainfall regions.

That pastoralists appreciate this was most apparent at the inaugural field day held by the North-West Branch in co-operation with the Yalgoo Branch of the Pastoralists' Association recently.

Plots at Gabyon Station showed Wandarrie grasses recovering on both light and heavy country, but there was little to be seen in the way of recovery of shrubs. These may need long-term spelling for regrowth, or they may perhaps come away quickly later on as a second stage recovery after ground cover has been regenerated.

Saltbush trials at Barnong Station excited a lot of interest and discussion. About 20 acres of very badly rundown saltbush country was fenced off in 1952. Heavy rains in March and April, 1953, germinated a new stand of perennial saltbushes, and these have now developed to the bush stage capable of providing the heavy grazing capacity for which these areas were famous in the early years of settlement.

Where saltbush was not protected during the years following those 1953 rains, there is little of this generation of saltbushes to be seen.

Grazing management trials have been designed to determine just how long the spell must be after that regenerating rain in order to develop saltbushes to the stage where they can stand up to grazing, and what degree of grazing can then be applied.

In the meantime, from observations made at Barnong and at Yarrabubba Stations, it seems that saltbushes must firstly have that bountiful summer rain to produce the seedlings, and then must be continuously protected from grazing

until they have enjoyed two effective summer growing seasons.

This is a long spell and very different from the six weeks' "deferment" we speak of for northern grasslands.

A good stand of perennial saltbush is, however, a very rewarding asset, and those with areas of saltbush country which can carry only a fraction of the stock it did years ago, should seriously consider paddocking off a section and initiating a recovery programme. Good summer rains have recently fallen throughout the pastoral areas, so right now is the time to look for those seedlings and to adjust stocking routines to protect at least a section of them throughout the establishment period.

UREA AS A SUPPLEMENT FOR SHEEP ON DRY FEED

During recent months much publicity has been given to the potential value of urea as a supplement to increase the feed value of dry mature roughage. This publicity has prompted many enquiries from farmers who wish to make immediate use of mixtures of urea and molasses.

Officers of the West Australian Department of Agriculture have made a careful study of the experiments which have been carried out in South Africa and in Victoria. These experiments, mostly with penned sheep, have shown that losses in body weight can be reduced or prevented when urea and molasses are added to low-grade roughage..

Unfortunately, very little large-scale evidence is available to indicate the economic return which is likely to result from the application of sprays containing urea and molasses to dry roughage. At present there is no assurance that farmers in Western Australia will gain worthwhile increases in production from using this new technique. In any case, urea is an expensive imported product which can cause serious losses of stock if used incorrectly.

The West Australian Department of Agriculture is conducting experiments to obtain clear-cut information concerning the financial returns which can be expected when urea mixtures are sprayed on cereal stubbles and dry mature grass. These trials should also reveal the practical difficulties which are likely to be encountered when using boom sprays and other machines to distribute solutions on various types of pasture and stubble.

Because of the doubts concerning the economic returns likely to be obtained, it is recommended that stock owners defer the use of urea until further information is available. However, should anyone wish to make immediate use of this material the following application rates should be used.

Thirty lb. of urea and 100 lb. of molasses are required for each ton of dry feed. The urea is dissolved in water, mixed with the molasses, and enough extra water is added to make the mixture sprayable. It is applied with a boom spray to the proper area of pasture. In practice, four or five days' supply could be applied at one time.

Stock may ignore the sticky pasture at first, and may need to be trained by confinement in a small paddock of treated feed.

The feature of pasture spraying is that there is no danger of poisoning as the daily dose of urea is eaten in many small portions through the day.

Costs—

Urea costs about £83 per ton or 9d. per lb.

The cost of 30 lb. of urea and 100 lb. of molasses required for one ton of dry feed is about £3. This would suffice for 1,000 sheep for one day *if all the dry feed is eaten.*

Use with Cereal Grain—

Solutions of urea have been added to cereal grains but extreme care is essential in mixing and feeding if serious losses of stock are to be avoided. It should be safe to add 1½ lb. of urea (dissolved in water) to each 100 lb. of cereal grain. However, wherever sheep may be given the opportunity to consume considerable quantities of grain (as when fed once or twice each week) risk of losses from treated grain *are always present.*

March 11, 1960.

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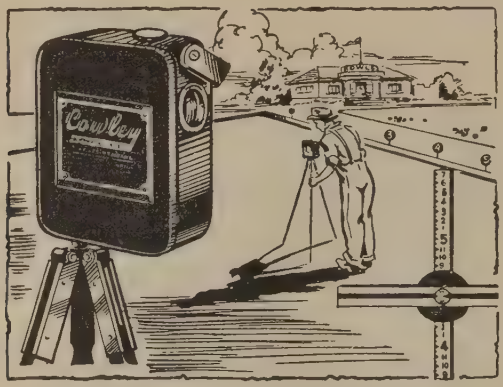

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Mosaic Disease of Cucumbers

A NEW RESISTANT VARIETY

By H. L. HARVEY, B.Sc. (Agric.), Senior Plant Pathologist.

TESTS with the cucumber variety Ohio MR 200 which was introduced from the U.S.A. (1), have shown it to be almost unaffected by the cucumber mosaic virus. It is a good type and satisfactory yielder and promises to be the answer to the cucumber mosaic problem in Western Australia.

Mosaic is one of the serious hazards to commercial cucumber growing, especially in the early plantings in the Balcatta market gardens. All locally-grown varieties are very susceptible to the disease and in surveys commenced in 1951, infections up to 35 per cent. occurred (2). In the spring crops of 1959 in Balcatta, the disease was even more prevalent, infections in some cases exceeding 60 per cent. in the field soon after transplanting from the seedling cold frames. Stunting was often so severe that crops were regarded as a total loss and ploughed under.

The disease, which is caused by a virus, is transmitted by aphids which occurred in plague form in the spring of 1959. Transmission may also occur by plant contact and by handling, but there is no evidence of transmission through cucumber seeds or soil in Western Australia.

SYMPTOMS

Infected cucumber vines are very conspicuous in the field when compared with healthy vines. They are stunted due to rosetting or shortening of the stem. The leaves are small and their very pale colour contrasts with the dark green foliage of normal plants. Infected leaves show an obvious yellow and green mottle or mosaic pattern (Fig. 1) and if diseased plants produce fruit they may be undersized and malformed with mottling of the skin and the formation of dark green blisters (Fig 2). The disease may kill plants prematurely.

HOSTS

The cucumber mosaic virus has a very wide host range, including members of the melon family, tomatoes, N.Z. lupins, silver beet (Chard) and numerous ornamental species. The disease is of greatest economic importance in Western Australia in cucumber crops.

TESTS WITH OHIO MR 200

Preliminary field tests in 1958 indicated that Ohio MR 200 was a desirable type of cucumber with a high resistance to mosaic, and this was substantiated in 1959 in a yield experiment under severe mosaic conditions at the Vegetable Research Station at Herdsman Lake and in a gardener's trial at Balcatta.

Fig. 1.—Leaf mottling on a cucumber seedling infected with mosaic

YIELD EXPERIMENTS AT HERDSMAN LAKE—SPRING, 1959

Seedlings of the cucumber varieties Ohio MR 200, Marketer, Davis Perfect and Palmetto were planted out 7/9/59 in a randomised block design of six replications with four hills per plot. Sap inoculations with the cucumber mosaic virus were made on 28/9/59 and 14/10/59 and later the hills were thinned to single plants. The inocu-

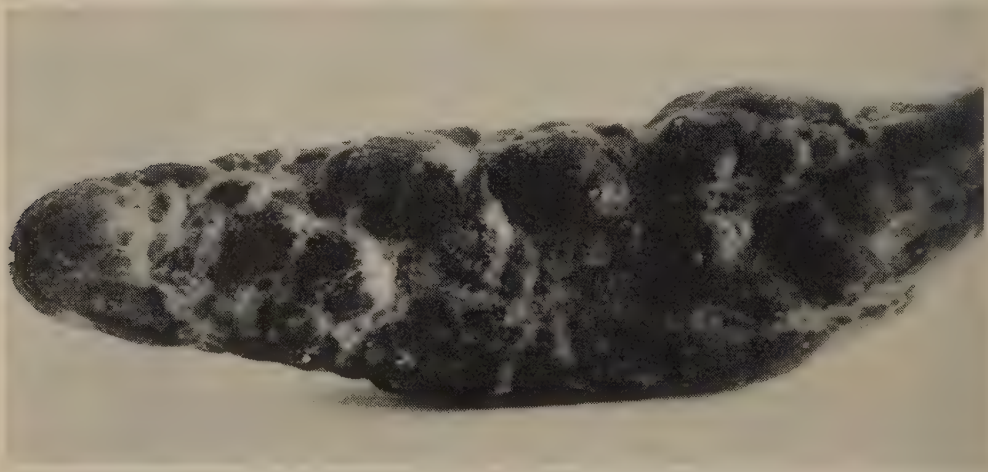

Fig. 2—Mottle and dark green blisters on a Davis Perfect cucumber infected with cucumber mosaic

Fig. 3.—Davis Perfect cucumber plants (left) stunted by mosaic during early growth and Ohio MR 200 plants (right) growing normally at the Herdsman's Lake Research Station. All plants were inoculated with the mosaic virus

lum had been retained from naturally infected cucumber plants grown at Herdsman Lake the previous season.

Mosaic symptoms were very slight or absent in Ohio plants but very conspicuous in other varieties which soon became badly stunted (Fig. 3). Picking was commenced on 14/10/59 and concluded 30/12/59 and total yields and percentages of first quality fruit are presented in Table 1.

Table 1

Variety	Total Yield	First Quality Cucumbers
	Lb.	%
Ohio MR 200	93·66	85
Davis Perfect	11·70	12
Marketer	7·64	37
Palmetto	2·63	0
Difference for significance at 0·1% level	20·89	....

It is apparent from these figures that in total yields of fruit and in quality, Ohio was far superior to other varieties.

GARDENERS' TRIAL AT BALCATTA—SPRING, 1959

Two rows (60 plants) of Ohio MR 200 were grown in the middle of a commercial planting of Davis Perfect in the early spring of 1959. Following a heavy aphid infestation three weeks after transplanting, mosaic spread in the Davis Perfect plants finally infecting and badly stunting 60 per cent. or more of them. In Ohio, by contrast, a few plants showed only mild mottling without stunting (Fig. 4) and produced high quality fruit. Owing to the rapid deterioration of the main crop of Davis Perfect the gardener abandoned the whole area and no comparative yield figures were available. From the first two or three picks and from assessments of mosaic incidence, however, it was apparent that Ohio would have outlived and outyielded Davis Perfect, had the area not been abandoned.

Fig. 4.—Cucumbers in the gardeners' trial at Balcatta. The two good rows at the right of centre are mosaic-resistant variety Ohio MR 200. The remainder are Davis Perfect, which are pale and stunted. Both varieties were exposed to a severe outbreak of mosaic which occurred in the district

CONTROL

Hitherto, the control of mosaic in cucumbers has been directed at the reduction of aphid populations through the medium of weed control, garden sanitation and the use of insecticides and also by roguing diseased plants.

As adequate supplies of seed become available, the adoption of Ohio MR 200 for early spring plantings is recommended in mosaic-liable districts such as Balcatta and parts of Osborne Park. At present only small trial lots of seed can be made available from limited supplies and market gardeners requiring seed for trial should address requests to the Department of Agriculture, South Perth.

ACKNOWLEDGMENTS

The author is indebted to—

Dr. J. D. Wilson, Professor of Plant Pathology, Ohio Agricultural Experiment Station, Ohio, U.S.A., for seed supplies;

Mr. M. Thornett, Biometrician, Plant Research Division, for statistical analyses;

the Horticultural Division and Vegetable Research Station Manager, for assistance in conducting experiments and;

Mr. M. Stevens, market gardener, Balcatta, for providing facilities to conduct the gardener's trial.

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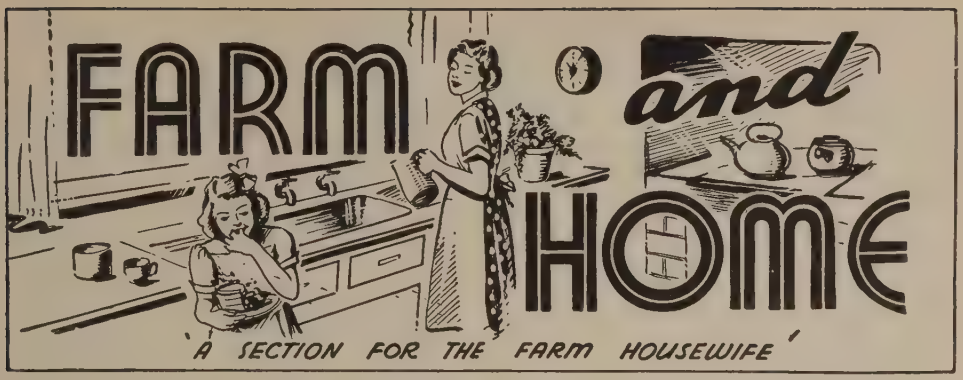


Meals for Cooler Seasons

By HELEN M. GLOSTER

ALTHOUGH March, April and May go to make up the "official" autumn season, the Clerk of the Weather does not always send us typical autumn weather. Once Easter has passed however, we can usually expect cooler days and can look forward to the preparation and enjoyment of foods that are richer and more substantial than our hot weather fare. Here are some suggestions for two universal favourites—roast duck and baked ham.

ROAST DUCK WITH ORANGE AND PINEAPPLE

Ingredients.

2 5-lb. dressed ducks.
Duck livers.
2 oranges.
4 slices tinned pineapple.
3 cloves of garlic (or an onion).
⅓ cup brandy.
¾ cup dry sherry.
1½ cups stock.
1 teaspoon powdered tarragon.
⅓ cup currant jelly.
Tomato sauce to taste.
2 tablespoons butter.
1 teaspoon salt.
¼ teaspoon black pepper.
3 level tablespoons flour.

Method.

Peel rind from oranges, shred thinly and put on one side. Remove pith and seeds, and quarter the oranges.

Mix oranges, pineapple, chopped garlic or onion and tarragon. Stuff ducks with this mixture.

Place ducks on trivets or racks in a baking tin and bake in a slow oven (325°F.) for 2½ hours or until cooked.

Saute the duck livers in butter for 10 minutes.

Heat the brandy, light it and pour over the livers.

When the flame dies down, remove the livers, chop and leave on side of stove to keep warm.

To the liquid remaining in the saucepan add shredded or grated orange rind and a finely-chopped garlic clove. Simmer for 5 minutes.

Mix wine, stock, tomato sauce, jelly, salt and pepper. Blend flour with this mixture.

Add to liquid in saucepan, cook until smooth, stirring all the time.

Add chopped livers and *simmer* for 15 minutes.

Pour into a sauce tureen and serve with duck.

Notes.

If ducks are smaller or larger, allow 30 minutes cooking time for each pound by weight of *individual* ducks.

No fat is necessary in the pan for cooking. There is sufficient fat under the skin of the duck to roast the duck satisfactorily.

Tarragon is a kitchen herb. If this is not available, sage or mixed herbs are suggested as alternatives.

Saute is a term used for frying in a small quantity of fat. The lid is sometimes left on the saucepan.

A SIMPLER RECIPE FOR ROAST DUCK

Ingredients.

1 duck (dressed).
3 or 4 new season's apples.
6 prunes (soaked).
Salt, pepper.
Giblets.
1 dessertspoon cornflour.
1 cup stock.
Watercress or parsley.

Method.

Season the duck inside and out with salt.

Fill with a stuffing of cut-up apples and prunes.

Truss the duck.

Bake according to preceding recipe allowing 30 minutes cooking time for each pound of duck.

A piece of greased paper (a butter wrapper) may be placed over the duck while cooking.

Remove paper half-hour before serving and dredge the breast with flour and leave in oven until nicely browned.

Serve with brown gravy made with cornflour, chopped giblets and stock.

Garnish with watercress or parsley.

Green peas and chipped potatoes are suitable accompaniments.

The Gravy.

Leave a little of the drippings from the duck in baking tin.

Add cornflour and brown well.

Stir in stock, stir until smooth.

Boil a few minutes.

At the last minute add chopped giblets (previously cooked in stock).

BAKED HAM (1)

Ingredients.

1 12 lb. uncooked ham.
2 large onions.
1 stick of celery.
2 garlic cloves.
3 cloves.
2 teacups dry sherry.
1½ tablespoons flour.
1 pint chicken or meat stock.
Orange segments.

Method.

Skin and score ham, slice the onion and garlic, chop up celery.

Bake the ham in a slow oven in a dish with onions, garlic, celery, cloves and wine.

Bake for 5 hours, basting frequently.

Remove ham from pan and pour off all but 2 tablespoons of fat.

Add flour and stir until smooth.

Add the stock and bring to boil, stirring all the time. Boil several minutes.

Serve sauce with ham.

Garnish with segments of orange.

Accompany this dish with hot vegetables.

BAKED HAM (2)

Method.

Bake in a **slow** oven allowing 25 minutes for each pound of meat. Longer is necessary for a boneless ham.

Half an hour before serving take from oven, remove the rind and score the fat crosswise.

Add glaze and return to moderate to hot oven to brown for an extra 15 or 20 minutes.

Glazes for Ham.

A clove may be inserted into each scored square if desired.

No. 1.

¾ cup brown sugar.
1 tablespoon mustard.
⅓ cup of pickle juice or spiced fruit juice.

No. 2.

1 cup brown sugar.
¾ cup crushed pineapple.

BAKED HAM (3)

Method.

Soak the ham overnight.

Dry the ham with a cloth, then cover thickly with a crust made of flour and water.

Roll ham in muslin and bake 4 hours or 25 minutes to each pound.

Fat is required in baking tin. Baste frequently.

When cooked, remove crust and peel off the rind and sprinkle dried browned bread crumbs and nutmeg over the fat.

Decorate the knuckle with a paper frill.

A Plain Cushion

HAVE you a cushion that requires a new cover? Perhaps you need some new cushions for the verandah, porch or breakfast room. The directions given are for a square cushion measuring 19 in. x 19 in. The cushion of course may be made larger or smaller or an entirely different shape may be preferred.

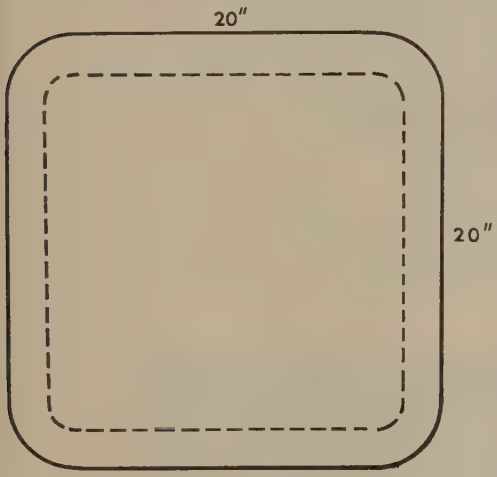
Materials required.

Just over ½ yd. of unbleached calico, ticking or other strong lining material (40 in. wide).

2 pieces of covering material 21 in. x 21 in. (Shadow tissue, cretonne, strong printed cottons are all suitable; 45 in. is a good width when buying).

2½ lb. kapok or other filling.

Some 2½ yd. lengths of thick knitting wool (optional).



To Make the Cushion.

From an old carboard box cut a pattern for rounding the corners of the cushion.

For convenience when machining, cut a width gauge from the box.

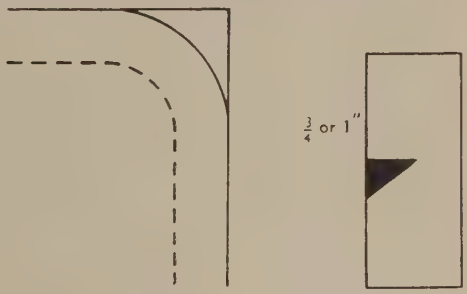
Make it ¾ in. to 1 in. deep according to the width you intend to make the border.

Machine the lining pieces together to form a square. An opening should be left along one side for inserting the kapok.

Using the pattern for the corners, round off each corner and cut off the surplus material.

Turn on to the right side.

Machine the cover pieces together on the wrong side and leave an opening to correspond with the opening in the lining.



Make the cover ¾ in. to 1 in. wider than lining on each edge.

Round off the corners, as for lining and turn cover on to right side.

Using the width gauge, machine the cover ¾ in. to 1 in. from the edge so that lining will fit the cushion exactly.

Leave the cushion unsewn on the edge where the kapok is to be inserted.

Place lining inside cushion cover.

Fill the cushion with kapok or other filling then sew up the gap in the lining.

Complete the unsewn portion of the cover.

For a really professional finish, pad the border with thick strands of knitting wool left over from last year's knitting.

These covers are easily removed for washing. Unpick along one side and remove cover.

THOSE FROCK BUTTONS

Have you a frock which requires the removal of buttons before going to the wash or to the dry cleaners?

Study the buttons. If they are stemmed buttons with the holes on the stems, try fastening them to the frock with small brass safety pins. Then it will be a quick and easy matter to remove and replace the buttons as required.

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Fig. 1—A lamb affected by tetanus following marking. Note the rigidity of the limbs and the retraction of the head and neck

TETANUS IN FARM ANIMALS

By R. C. TOOP, B.V.Sc., Chief Veterinary Surgeon

THE disease tetanus occurs in practically all of the animals and man. It is caused by the tetanus bacillus (Clostridium tetani) and results from contamination of wounds and raw surfaces with materials such as earth or dust containing these organisms.

The tetanus bacillus is widely distributed in nature and frequently occurs in the soil of cultivated land, in stockyards and in animal manure. Upon gaining access to a wound tetanus bacilli show no tendency to invade the body by way of the blood circulation and set up a general infection, but remain localised at the site of infection where they multiply and in the process elaborate an extremely potent toxin.

Tetanus toxin is one of the most powerful of the known poisons. It has a special affinity for nervous tissues by which it is readily absorbed and which it stimulates to produce the spasmodic muscular contractions so characteristic of the disease. The tetanus bacillus is an anaerobe which thrives in the absence of air. Consequently deep punctured wounds from which air is excluded are more dangerous than large superficial ones. Any wound, however, may become infected and particularly if it contains dead or necrotic tissue or has become covered over by accumulated discharges and scabs. The incubation period of the disease, i.e. the period which elapses from the infection of the wound until the appearance of symptoms, ranges from 3 to 21 days but is usually about 7 days.

Of the domesticated animals the horse is the most susceptible but under the conditions which obtain in Western Australia the most frequent and most serious losses from the disease occur among sheep. Cases occurring in horses are for the most part isolated ones and are sometimes a sequel to nail punctures in the feet, stake wounds, harness galls, or castration. Among sheep, mortalities involving the loss of a considerable number of animals are from time to time encountered and are generally associated with marking and shearing. The disease occurs much less frequently in cattle and pigs. The mortality rate is high; 75 to 80 per cent. of horses and cattle which become affected die of the disease while in the smaller animals such as sheep and pigs, recovery rarely occurs. Treat-

ment of the disease is not usually attended by satisfactory results and is only worth attempting in horses and cattle.

TETANUS IN SHEEP

The majority of the outbreaks of tetanus which occur in sheep are associated with marking or shearing and result from the infection of castration, tailing and shear cut wounds. Such mortalities may be serious resulting in the death of a considerable number of animals. In newborn lambs infection of the navel cord may take place before healing has occurred.

Serious mortalities from tetanus have also been encountered in sheep following upon inoculation with vaccines for the prevention of other diseases, and these may be attributed to careless methods, including the contamination of vaccine exposed in open containers to dust containing tetanus spores or failure to sterilise syringe and needles before use.

Symptoms in Sheep.

With the onset of symptoms the gait becomes stiff and stilted and the animal is soon unable to stand. Sheep affected by tetanus are almost invariably found stretched out on their sides with the legs rigidly extended and the head and neck bent backwards (but sometimes downwards or to one side). Characteristically the muscles are in a condition of rigid contraction and the body is stiff and board-like. This will be particularly noticeable upon lifting the affected animal from the ground. In many cases due to contraction of the masticatory muscles the jaws are locked together and the mouth cannot be opened, this condition being known as trismus or "lock-jaw." A moderate amount of tympanitis or bloating is a constant feature of the disease. Tetanus in sheep is almost without exception, fatal, death occurring within a few days from the appearance of symptoms.

Prevention.

Hygienic precautions.—Since the disease results from the contamination of wounds with tetanus bacilli or spores contained in the soil, hygienic precautions should always be adopted whenever the likelihood of such infection exists. These will be particularly applicable in connection with lamb marking.

Old sheep yards which are likely to be heavily contaminated should be avoided and marking operations should be conducted in a well-grassed temporary enclosure, erected in a convenient corner of the paddock, from hurdles or other suitable material. Instruments should be sterilised by boiling before use and when not actually in use they should be placed in an antiseptic such as a 2 per cent. solution of lysol (lysol 1 fluid ounce, water 2½ pints).

Following marking, lambs should be set down carefully so that the wounds do not come into contact with the ground. Prior to the commencement of shearing, sheds should be given a thorough cleaning and shearcuts should be dressed with tincture of iodine or some other suitable antiseptic. Following shearing or marking, sheep should be released into clean, well-grassed paddocks. Since infection of the wounds may subsequently occur in yards or paddocks by contamination with earth or dust, the application of hygiene precautions may not always succeed in preventing the disease and upon properties where recurrent losses from tetanus have occurred other methods of control must be employed.

Immunisation with Tetanus Toxoid.—Vaccination with tetanus toxoid provides the most effective means of preventing the disease. Inoculation with this product confers upon the treated animal, a strong and lasting immunity which develops after an interval of about 14 days from the time of injection. The dose of tetanus toxoid for the sheep is 1 c.c., given subcutaneously (beneath the skin) and the cost of treatment is about 2½d. per head. Tetanus toxoid will be found especially valuable for the prevention of outbreaks of tetanus associated with shearing. Vaccination must be completed not less than 14 days prior to the date upon which shearing is timed to commence and may thereafter be relied upon to afford a high measure of protection.

Tetanus toxoid might also be employed for the protection of lambs following marking. Since lambing, however, is usually spread over a period of six to eight weeks during which time lambs are dropping irregularly and vaccination must be carried out at least 14 days in advance

of marking, this method of prevention may not generally be found practicable.

Tetanus Anti-toxin. — Alternatively lambs may be protected against the disease by the injection of tetanus anti-toxin given at the time when marking operations are performed which will immediately provide them with a passive immunity of two to three weeks' duration. Tetanus anti-toxin is a serum prepared from horses which have been immunised by repeated injections of tetanus toxoid. Blood from such immunised horses is drawn from the jugular vein into a sterile container and allowed to stand for 24 hours. The clear fluid or serum which separates upon standing is drawn off, suitably preserved and standardised. This serum contains immune bodies or anti-bodies which are able to neutralise tetanus toxin. The immunity conferred by tetanus anti-toxin becomes effective within a few hours after the injection of the serum but it is of short duration lasting only two to three weeks. It is a passive immunity which will last only until the anti-toxin has been eliminated from the body. It, however, serves to protect the animal during the period while the healing of the wound is occurring.

The dose of tetanus anti-toxin for sheep and lambs is 100 units given subcutaneously. This product is available from the Commonwealth Department of Health, Perth, in bottles of 100 c.c., each c.c. containing 100 units of anti-toxin. An injection of 1 c.c. will therefore provide the prescribed dose and the cost of treatment is slightly less than 2½d. per head.

If it is desired to prolong the duration of the immunity simultaneous inoculation with tetanus anti-toxin and tetanus toxoid may be practised 100 units of anti-toxin being injected beneath the skin of the brisket on one side and 1 c.c. of toxoid being injected on the opposite side. By this means both an immediate and enduring immunity will be obtained which should protect the lamb from any ordinary infection to which it may become exposed and should tide it over the first shearing.

Fig. 2.—A horse affected by tetanus
(After Hulyra and Marek)

TETANUS IN THE HORSE

Tetanus in horses is most frequently associated with wounds of the lower portions of the limbs such as nail punctures in the feet or penetrating wounds caused by stakes and other objects. The disease is a not infrequent sequel to castration particularly when this operation is performed in stable yards. It may also result from the infection of saddle and harness galls and other surface wounds.

Symptoms in the Horse.

As in the other animals, tetanus in horses is characterised by spasmodic contraction and stiffening of the body musculature. This usually commences in the muscles of the head and neck but rapidly extends to other groups of muscles. In an advanced case the affected animal stands stiffly with the forelegs spread widely apart; the neck is extended, the tail is held rigidly and somewhat elevated and the abdomen is tucked up. The nostrils are dilated and trumpet-like; the ears are erect and the lips are drawn back exposing the teeth.

Protrusion of the membrana nictitans (third eye-lid or haw) from the inner corner of the eye is a characteristic feature of the disease and this will become very pronounced when the head is elevated by a hand placed beneath the lower jaw. Affected animals feed slowly and seem to have difficulty in swallowing. In many cases due to contraction of the masseter muscles the mouth cannot be opened and although the appetite remains good the animal is unable to feed. This closure of the jaws is known as trismus.

The muscles of the body are hard and boardlike to the touch and this will be very apparent when the hand is placed upon the rump of the affected animal. The animal moves with a stiff straddling gait and has great difficulty in turning and backing. The joints are stiff and can only be flexed by the application of considerable force.

Horses affected by tetanus are very sensitive to sound and light and when suddenly disturbed the muscle spasms may be increased to such an extent as to cause the animal to fall to the ground. The mortality rate is very high, the disease terminating fatally in from 75 to 80 per cent. of cases. Death usually occurs in from 3-10 days but should the animal survive for a fortnight the prospects of ultimate recovery are reasonably good.

Prevention.

In localities where tetanus is prevalent, wounds should receive special attention and should be regularly cleansed and dressed with an antiseptic preparation. When operations such as castration are to be performed, aseptic precautions should be observed. Instruments should be sterilised by boiling and the skin at the site of the operation swabbed with an antiseptic. The horse should be cast on a clean well-grassed area, stock yards and stable yards being avoided.

The injection of 500 units of tetanus toxoid shortly after a wound has been sustained or when an operation is about to be performed, will in most cases protect the animal from infection during the ensuing period of 2-3 weeks while the wound is healing. As in the case of sheep, vaccination with tetanus toxoid produces in the horse a strong and enduring immunity and this might well be adopted as a routine procedure on all properties upon which the disease occurs. The dose of tetanus toxoid for the horse is 10 c.c. given subcutaneously. A second injection of 10 c.c. given after an interval of a year will confer upon the animal a life-long immunity.

Treatment.

The treatment of tetanus in horses does not offer very favourable prospects of success. In the first place the wound should be sought and thoroughly disinfected. All discharges and dead or necrotic tissue should be removed and this should be followed by regular dressings with an antiseptic preparation rich in oxygen such as potassium permanganate or hydrogen peroxide. The animal should be placed in a quiet dark loose box and disturbed as little as possible. The diet should consist of soft easily digested food such as green stuff, bran mashes or boiled oats or linseed. When the animal is unable to masticate, liquid foods such as thin gruel or sloppy bran mashes should be made available. The bowels should be regulated by the administration of magnesium sulphate (Epsom salts) in the drinking water. Treatment with one of the tranquillising drugs which have recently become available may prove helpful but would require the services of a veterinary surgeon.

Tetanus anti-toxin is sometimes used in the treatment of the disease but since this product can have no effect upon the toxin which has already combined with the nervous tissues and can only neutralise toxin which may continue to be produced at the site of infection, its value as a curative is extremely doubtful. Very large doses of anti-toxin repeated at

frequent intervals must be employed and since this is expensive its use can only be justified in the treatment of very valuable animals. The treatment of the disease is always difficult and whenever possible veterinary assistance should be obtained. Some recoveries will occur with treatment but the outlook cannot be generally regarded as very hopeful.

TETANUS IN OTHER ANIMALS

Tetanus is not very frequently met with in other animals. In cattle it sometimes occurs after calving when it may be associated with retention of the afterbirth or metritis (inflammation of the uterus), while in calves it may be a sequel to castration. The symptoms in cattle are very similar to those exhibited by horses and include general muscular stiffness, trismus (locking of the jaws), protrusion of the membrana nictitans and bloating.

Tetanus is uncommon amongst pigs but may occur as a sequel to castration, and is rarely seen in dogs. In these animals the symptoms follow much the same pattern as those shown by other animals and the disease is nearly always fatal.

NEW RESEARCH STATION AT BADGINGARRA

Considerable progress has been made in the development and preparations for equipping of the new light lands research station situated some 5 miles north of Badgingarra townsite. The Minister for Agriculture (Mr. C. D. Nalder), in commenting on this referred to the purpose of the station in investigating the problems of developing and utilising the light lands west of the Midland railway and including those north and south of the Hill River.

The station comprises some 3,060 acres acquired as undeveloped country and includes soil types largely representative of the area which it is to serve. An area of approximately 600 acres was ploughed last year and is in course of being fire-harrowed and will be cross-ploughed ready for planting in the coming season. The fallowed land will be soil-surveyed to enable the satisfactory siting of the cereal and other experiments which are being designed as part of this year's programme. The major portion of this fallow will be planted to wheat, oats and barley and will include a range of experiments to determine the performance of different varieties of the three cereals and responses to fertiliser and other treatments. Fertilisers will be applied at the rate of 180 lb. of mixed super-copper-zinc for main crop on new land and a sufficient quantity of this mixed fertiliser has been ordered for delivery in April.

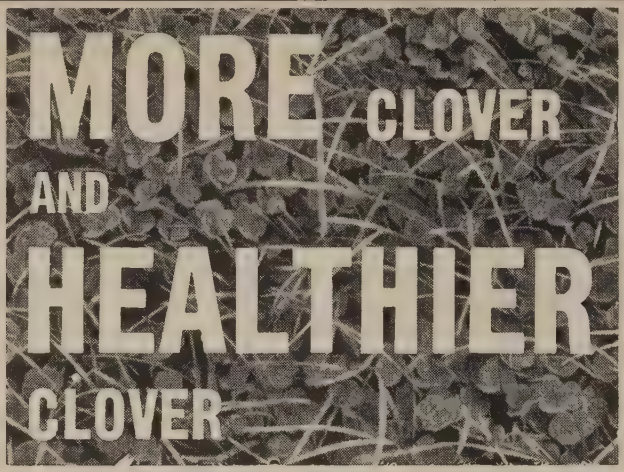
A further 500 acres has been logged and burned in preparation for ploughing towards the end of the coming winter in preparation for cropping in 1961. It is anticipated that the first area will be fenced by the middle of 1960 and commencement will then be made on the fencing of the second area.

The Mines Department has put down an exploratory bore on the station as part of its general investigation of the water supply in the Badgingarra area. The bore is to be handed over for the use of the station and arrangements can then be made regarding equipping and reticulation.

Tenders have been called for the erection of a pre-fabricated machinery shed 100 ft. x 28 ft. and also a large lockup workshop. Interim caravan accommodation will be provided for a limited staff pending the construction of two new houses on the property.

A new 3-5 ton truck is being ordered and hand tools and other small equipment have been purchased for use on the station. A tractor, plough, cultivation and planting machinery are being purchased for use during the coming planting period, and subsequently.

Mr. Nalder said that the arrangements were well in hand for commencing effective utilisation of the new station and hoped that even by the end of the year, the Department would have some useful information following the first cropping season, and could then make further progress in the investigation of the problems of cereal and, eventually, pasture and stock production under the conditions applying to the extensive area of land to be served by the research station.



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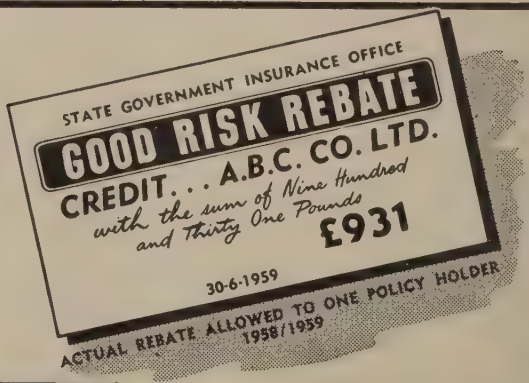
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The "Merredin Early" Strain

OF WIMMERA RYEGRASS

By J. T. REEVES, Plant Breeder, and H. M. FISHER, Agricultural Adviser

WITH the exception of subterranean clover, no introduced pasture species has a wider application in Western Australia than Wimmera ryegrass. This popular pasture plant is believed to have originated as a natural cross between two ryegrass species and first became prominent in the Wimmera district of Victoria.

The hybrid origin of the plant probably accounts for the very wide variability which occurs among individual plants grown from the commercial seed. The average commercial sample of seed will produce plants which mature and set seed at varying times over a fairly lengthy period, and also show a very wide variation in their growth habits.

Some may be tall and erect while others tend to be short with the stalks and leaves spreading outward rather than upward. Some plants are spindly and sparsely-leaved while others stool out and produce a dense stand of leafage.

PLANT IMPROVEMENT

About 20 years ago, plant breeders commenced to utilise this variation to produce better strains of Wimmera ryegrass, giving particular attention to the very early-maturing types.

At the Merredin Research Station in 1941, a number of single plant selections were made from bulk pastures and from field experiments with Wimmera ryegrass. Seven years later, 140 plants were selected from a paddock on the Avondale Research Station. These were found to be earlier and more prolific than the commercial strain and were subsequently transferred to Merredin for comparison with the material selected there.

From this work emerged two lines—one from Avondale and the other from Merredin. Both were similar in characteristics, being more vigorous and approximately a week to ten days earlier in maturity than

Inspecting bulk plots of Merredin Early ryegrass at the Newdegate Demonstration Farm

the commercial strain. Seed multiplication plots of each were sown at Merredin and critically compared. The Avondale strain appeared to be slightly more prolific, and prior to its release for general cultivation it was formally named "Merredin Early Strain" in allusion to its general suitability for this area and also to its final selection on the Merredin Research Station.

Because of its very early maturity this strain has been found to become established and persist in the drier districts with a shorter season, giving very encouraging results on areas which had previously failed to support the commercial strain. Also, because of its ability to withstand drier conditions, "Merredin Early Strain" is considered more suitable than the later strains in assisting towards the reclamation of areas where high salt concentrations present a serious problem in the establishment of any cover. It also persists better in subterranean clover pastures and gives better re-establishment after cereal cropping. The greater uniformity and more even maturity of the strain is an advantage when harvesting seed.

The initial pure line with 15 selected plants was sown in 1953 and the first bulk seed was distributed in 2 lb. lots to 69 farmers early in 1955. Since then pedigree seed of "Merredin Early" has been produced each year for general sale to farmers. The strain undergoes continual selection for the maintenance of purity in exactly the same manner as pedigree cereal seed and is the only pasture species at present commercially available to receive this type of close supervision.

Recommended procedures for establishment and maintenance of "Merredin Early" are identical with those generally relating to Wimmera ryegrass and no special measures are necessary.

Contour Working Holds the Rain Where it Falls

Contour working is thought to make the land more boggy. This is not so because rain is held in contour working furrows right where it falls. Boggy conditions are caused by water running and accumulating. If water is prevented from running the normally dry ridges receive more water and the wet spots receive less water. Contour working increases yields.

List of

REGISTERED FERTILISERS

By H. G. CARISS, Inspector of Fertilisers

IN accordance with the provisions of the Fertilisers Act, 1928-1955, it is required that—with the exception of bulk sales to a manufacturer and those made in accordance with a buyer's written prescription—all fertilisers sold are required to be registered annually, the registration year being from November 1 to October 31 following. The list of fertilisers registered for the year commencing November 1, 1959, is set out herewith in tabular form.

Under the provisions of the Act, not only must all fertilisers sold in this State be registered, but they must carry a registered brand and be contained in a package which is conspicuously marked, or to which is attached a label conspicuously marked with a copy of the registered brand and the name of the fertiliser.

Further, in an amendment to the Act made in 1955 it was prescribed that in the case of quantities less than 1 cwt. the package or label must in addition carry particulars of the name and place of business of the manufacturer or importer together with the registered analysis and as set out in the prescribed application form for registration.

The 1955 amendment of the Act also, *inter alia*, amended the definition of a "fertiliser" and "specified ingredient" to include specific minor elements such as copper, zinc, manganese and molybdenum, etc. Lime, lime compounds and gypsum are fertilisers within the Act. The Act also provides that on the sale of any fertiliser an invoice shall be given and in the case of packages of 1 cwt. or more details of the specified ingredients as registered must be given.

Inspectors are appointed under the Act and periodical inspections of places where fertilisers are kept for sale are made and samples taken and submitted to the Government Laboratories for analysis. Where any discrepancies occur, appropriate action is taken. Manufacturers, as a rule, aim at maintaining the analysis of their various fertilisers and fertiliser mixtures as close to the guaranteed figures as possible.

Periodically, new fertiliser mixtures appear on the market, some of which are alleged to be a complete solution to optimum plant growth. Such fertilisers should be treated with caution as analysis could reveal them to be near worthless and certainly far more costly than their ingredients would justify. Before purchasing it is suggested that the Department of Agriculture be contacted and information sought as to their registered analyses and comparable values.

A simple guide to purchasing fertilisers and manures is the use of unit values. The system of units and unit values enables an approximation to be made of the comparative values of similar fertilisers. At first glance it could appear that the quoted costs per ton of a certain type of fertiliser produced by one manufacturer could be most satisfactory but a comparison on a unit value basis could show that this was not so.

The amount of each ingredient in a fertiliser, e.g., nitrogen in sulphate of ammonia, is measured in terms of units, 1 unit being 1 per cent. by weight per ton. Therefore, the unit value for nitrogen in

sulphate of ammonia containing 20 per cent. N and costing £37 per ton would be 37s. Similarly, unit values for nitrogen as blood and bone or urea, phosphoric anhydride in water soluble and other forms and either inorganic as super or organic in blood and bone or bone dust can be obtained.

The unit values calculated from the current year's registrations are set out below.

Nitrogen (N) as:—

	s.	d.
Blood, Blood and Bone, Bone Dust and other animal fertilisers	81	6
Nitrate	43	1
Ammonia	36	1
Urea	36	4

Phosphoric Anhydride (P_2O_5) as:—

Water soluble in superphosphate	11	5
Citrate soluble in superphosphate	11	5
Acid soluble in superphosphate and rock phosphate	6	5
Blood and Bone, Bone Dust and other animal fertilisers	20	2

Potash (K_2O) as:—

Sulphate	17	1
Muriate (Chloride)	11	11

These average unit values keep closely to the fertilising value, but it should be clearly understood that they are not a definite value as they are governed by current rates. However, the total of the individual unit values in each and every fertiliser is not necessarily the same as the quoted price, as the calculated values are only averages for all fertilisers of that type registered.

With mixed mineral fertilisers, viz. Potato Manures, etc., the extra costs of mixing and handling must be added to the cost of the ingredients. Though mixing costs vary with the actual mixture the unit values can still serve as a guide to the relative values of the different mixtures for any specific purpose.

To illustrate this comparison by unit values a simple example using two samples of blood and bone of different composition will serve.

	Nitrogen. %	Phosphoric Anhydride. %
X Brand Blood and Bone	6.5	10.0
Y Brand Blood and Bone	5.5	13.0

From the table of unit values for the current fertiliser year it will be noted that value for nitrogen in blood and bone is 81s. 6d. and for phosphoric anhydride 20s. 2d. Using these figures the compared value for each brand is:—

X Brand Blood and Bone.

	£	s.	d.
6.5 units of nitrogen @ 81s. 6d. per unit	26	9	9
10.0 units of phosphoric anhydride @ 20s. 2d. per unit	10	1	8
Total value	£36	11	5

Y Brand Blood and Bone.

	£	s.	d.
5.5 units of nitrogen @ 81s. 6d. per unit	22	8	3
13.0 units of phosphoric anhydride @ 20s. 2d. per unit	13	2	2
Total value	£35	10	5

It will be seen, therefore, from this comparison that the units in X brand are worth more than Y brand and therefore the former would be the more economical fertiliser to purchase when both are priced at £30. Unit values should only be used for comparing fertilisers of similar types. Inorganic fertilisers such as nitrate of soda or sulphate of ammonia should not be compared with blood and bone as a source of nitrogen.

When in doubt about the value of a fertiliser being marketed, intending buyers are strongly recommended to make inquiries at the Department of Agriculture before making any purchases. Full information on the provisions and requirements of the Fertilisers Act, 1928-1955, can be obtained and in addition technical advice is available concerning the use of fertiliser, whether it be for general agriculture, commercial or home gardening.

FERTILISERS

Name of Fertiliser	Reg. No.	Registered Brand	By Whom Registered	Nitrogen (N) as				Phosphoric Anhydride (P_2O_5) as				Potash (K_2O) as		Cash Price per ton at Works (W) or on Rails at Perth (P)
				Nitrate	Ammonia	Blood and Bone	Urea	Water Soluble	Citrate Soluble	Acid Soluble	Total	Sulphate	Muriate	
A. MINERAL				%	%	%	%	%	%	%	%	%	%	
1. Nitrogenous														
(a) *Nitrogen as Nitrate*														
Nitrate of Soda	61	C.S.M.L.	Cuming Smith Mt. Lyell Farmers Fertilisers Ltd.	16·00										£37/10/0 (PW) / £39/15/0 (PJW)
Do. do.	109	David Gray's	David Gray & Co. Ltd.	16·00										Packets
Do. do.	163	Symonds	E. Symonds	16·00										£8/8/0 per cwt.
Sodium Nitrate	215	Faulding	F. H. Faulding & Co. Ltd.	16·00										£6/1/4 per cwt.
Ammonium Nitrate	216	do.	do. do. do.	30·00										Packets
Nitrate of Soda	226	Wesfarmers	Westralian Farmers Co-op. Ltd.	16·00										£32/0/0 (Fremantle)
Chilean Nitrate of Soda	241	Champion	Chilean Nitrate Sales Corp. Pty. Ltd.	16·00										£40/0/0 (Perth)
Calcium Ammonium Nitrate	256	Lane's	Lane's (W.A.) Pty. Ltd.	20·50		33·00%	$Ca\ Co_3$							
(b) *Nitrate as Ammonia*														
Sulphate of Ammonia	1	Lightning	Cuming Smith Mt. Lyell Farmers Fertilisers Ltd.		20·50									£37 0/0 (PW) / £39/10/0 (GW) / £37/10/0(PJW)(AW)
Do. do.	4	I.C.I.A.N.Z.	do. do. do.		20·50									£37/0/0 (PW) / £39 10/0 (GW) / £37/10/0(PJW)(AW)
Do. do.	108	David Gray's	David Gray & Co. Ltd.		20·50									Packets
Do. do.	138	Best	William Pascoe & Son		20·50									Packets
Do. do.	160	Symonds	E. Symonds		20·50									Packets
Do. do.	171	Blue Cross	Agricultural Products Co.		20·50									Packets
Do. do.	196	Evergreen Fertilisers	Voldemars Ertners		20·50									£2/11/6 per cwt.
Do. do.	217	Faulding	F. H. Faulding & Co. Ltd.		20·00									Packets
Do. do.	227	Wesfarmers	Westralian Farmers Co-op. Ltd.		20·50									Packets
Do. do.	235	Boans	Boans Ltd.		20·50									£85/0/0 (PW)
(c) *Nitrogen as Urea*														
Urea	5	I.C.I.A.N.Z.	Cuming Smith Mt. Lyell Farmers Fertilisers Ltd.				46·00	Maximum Biuret 0·30%						Packets
Do.	107	David Gray's	David Gray & Co. Ltd.				46·00							£82/10/0 /P)
Urea 45%	135	B.A.S.F.	Henry H. York & Co. Pty. Ltd.				45·00							£82/10/0 (P)
Urea 46%	136	do.	do. do. do.				46·00							Packets
Urea—N45	172	Blue Cross	Agricultural Products Co.				45·00							Packets
Urea Pink	194	Pesticides	Wilcox Mofflin Ltd.				45·00	Maximum Biuret 0·40%						£80/0/0 (W) / £97/0/0 (P)
Kwikleaf 46	209	Hortico	Horticultural Industries Pty. Ltd.				46·0							Packets
Instant Lawn Green	240	Jaymar	Boans Ltd.				46·00							Packets
U.F. 38	251	George Warners	George C. Warner Laboratories Pty. Ltd.				38·00							£84/0/0 (P)
Urea 46%	254	Lane's	Lane's (W.A.) Pty. Ltd.				46·00							
2. Phosphatic														
(a) *Rock Phosphate*														
Ground Phosphate Rock	7	ML in diamond	Cuming Smith Mt. Lyell Farmers Fertilisers Ltd.							36·60	36·60			£11/15/0 (PW)
Do. do.	21	Sickle	do. do. do.							36·60	36·60			£11/15/0 (PW)
Do. do.	40	C.S.M.L.	do. do. do.							36·60	36·60			£11/15/0(PJW)(GW)
Do. do.	64	A in diamond	Albany Superphosphate Co. Pty. Ltd.							36·60	36·60			£11/15/0 (AW)
Do. do.	83	Cresco	Cresco Fertilisers (W.A.) Ltd.							36·60	36·60			£11/15/0 (PW)

(PW) Perth Works. (GW) Geraldton Works. (AW) Albany Works. (PJW) Picton Junction Works.

FERTILISERS—continued

Name of Fertiliser	Reg. No.	Registered Brand	By Whom Registered	Nitrogen (N) as				Phosphoric Anhydride (P_2O_5) as				Potash (K_2O) as		Cash Price per ton at Works (W) or on Rails at Perth (P)
				Nitrate	Ammonia	Blood and Bone	Urea	Water Soluble	Citrate Soluble	Acid Soluble	Total	Sulphate	Muriate	
A. MINERAL—*Ctd.*				%	%	%	%	%	%	%	%	%	%	
2. Phosphatic—*Ctd.*														
(b) *Superphosphate*														
Superphosphate 23%	6	ML in diamond	Cuming Smith Mt. Lyell Farmers Fertilisers Ltd.					17·00	3·00	3·00	23·00			£12/8/0 (PW)
Do.	20	Sickle	do. do. do.					17·00	3·00	3·00	23·00			£12/8/0 (PW)
Do.	39	C.S.M.L.	do. do. do.					17·00	3·00	3·00	23·00			£12/8/0 (PW) (PJW) (GW)
Do.	63	A in diamond	Albany Superphosphate Co. Pty. Ltd.					17·00	3·00	3·00	23·00			£12/8/0 (AW)
Do.	81	Cresco	Cresco Fertilisers (W.A.) Ltd.					17·00	3·00	3·00	23·00			£12/8/0 (PW)
Superphosphate	112	David Gray's	David Gray & Co. Ltd.					17·00	3·00	3·00	23·00			Packets
Do.	139	Best	William J. Pasco & Son					17·00	3·00	3·00	23·00			Packets
Do.	157	Symonds	E. Symond					17·00	3·00	3·00	23·00			Packets
Do.	170	Blue Cross	Agricultural Products Co.					17·00	3·00	3·00	23·00			Packets
Do.	228	Wesfarmers	Westralian Farmers Co-op. Ltd.					17·00	3·00	3·00	23·00			Packets
Do.	236	Boans	Boans Ltd.					17·00	3·00	3·00	23·00			Packets
(c) *Rock Phosphate and Superphosphate*														
50/50 Mixture	8	ML in diamond	Cuming Smith Mt. Lyell Farmers Fertilisers Ltd.					8·50	1·50	20·00	30·00			£12/16/6 (PW)
Do.	22	Sickle	do. do. do.					8·50	1·50	20·00	30·00			£12/16/6 (PW)
Do.	41	C.S.M.L.	do. do. do.					8·50	1·50	20·00	30·00			£12/16/6 (PJW)
Do.	65	A in diamond	Albany Superphosphate Co. Pty. Ltd.					8·50	1·50	20·00	30·00			£12/16/6 (AW)
Do.	82	Cresco	Cresco Fertilisers (W.A.) Ltd.					8·50	1·50	20·00	30·00			£12/16/6 (PW)
3. Potassic														
(a) *Potash Muriate*														
Muriate of Potash	2	Sun	Cuming Smith Mt. Lyell Farmers Fertilisers Ltd.										58·00	£34/10/0 (PW) (PJW) (AW) (jute bags) £33/5/0 (PW) (PJW) (AW) (paper bags)
Do. do.	110	David Gray's	David Gray & Co. Ltd.										58·00	Packets
Do. do.	137	Best	William Pascoe & Son										58·00	Packets
Do. do.	161	Symonds	E. Symonds										58·00	Packets
Do. do.	173	Blue Cross	Agricultural Products Co.										58·00	Packets
Do. do.	195	Evergreen Fertilisers	Voldemars Ertners										58·00	Packets
Do. do.	225	Wesfarmers	Westralian Farmers Co-op. Ltd.										58·00	Packets
Do. do.	234	Boans	Boans Ltd.										58·00	Packets
(b) *Potash as Sulphate*														
Sulphate of Potash	3	Sun	Cuming Smith Mt. Lyell Farmers Fertilisers Ltd.										48·00	£41/0/0 (PW) (jute bags) £43/0/0 (GW) (jute bags) £41/15/0 (PJW) (jute bags) £42/15/0 (AW) (jute bags) £39/0/0 (PW) (paper bags) £41/0/0 (AW) (paper bags) £39/15/0 (PJW) (paper bags) £41/0/0 (AW) (paper bags)

Do. do.	111	David Gray's	David Gray & Co. Ltd.		....	....	..	....	....	....	....	....	48·00	Packets
Do. do.	162	Symonds	E. Symonds		....	....	.	....	..	....	....	..	48·00	Packets
Do. do.	224	Wesfarmers	Westralian Farmers Co-op.		....	..	..	....	....	....	....	..	48·00	Packets
4. Nitrogen and Phosphoric Anhydride															
Potato Manure "C"	15	ML in diamond	Cuming Smith Mt. Lyell Farmers Fertilisers Ltd.	.	3·50		..	14·00	2·50	2·25	18·75	....	....	£19/3/0 (PW)
Do. do.	34	Sickle	do. do. do.	..	3·50	.	....	14·00	2·50	2·25	18·75	....	....	£19/3/0 (PW)
Do. do.	53	C.S.M.L.	do. do. do.	...	3·50			14·00	2·50	2·25	18·75	....	....	£19/4/6 (PJW) / £19/11/6 (GW)
Do. do.	77	A in diamond	Albany Superphosphate Co. Pty. Ltd.	.	3·50	.		14·00	2·50	2·25	18·75	....	....	£19/4/6 (AW)
Do. do.	97	Cresco	Cresco Fertilisers (W.A.) Ltd.	..	3·50		.	14·00	2·50	2·25	18·75	....	....	£19/3/0 (PW)
Garden Fertiliser	152	Sound	Cockburn Sound Fertilisers		....	4·00	..	3·00	1·00	2·00	6·00	..	....	£25/0/0 (PW)
5. Nitrogen. Phosphoric Anhydrine and Potash															
Potato Manure "A"	13	ML in diamond	Cuming Smith Mt. Lyell Farmers Fertilisers Ltd.		2·50			13·25	2·25	2·50	18·00	..	5·00	£19/16/6 (PW)
Potato Manure "B"	14	do.	do. do. do.	.	3·50			12·50	2·00	2·25	16·75	....	5·00	£21/2/0 (PW)
Potato Manure "E"	16	do. ..	do. do. do.	.	3·50			11·50	2·00	2·00	15·50	....	8·00	£22/5/6 (PW)
Orchard Manure ..	17	do.	do. do. do.	.	3·50			12·50	2·00	2·25	16·75	....	5·00	£21/2/0 (PW)
Garden Fertiliser	18	do. ..	do. do. do.	....	3·50			11·50	2·00	2·00	15·50	....	8·00	£22/5/6 (PW)
Potato Manure "A"	32	Sickle ..	do. do. do.		2·50			13·25	2·25	2·50	18·00	....	5·00	£19/16/6 (PW)
Potato Manure "B"	33	do. ..	do. do. do.		3·50			12·50	2·00	2·25	16·75	....	5·00	£21/2/0 (PW)
Potato Manure "E"	35	do. ..	do. do. do.		3·50			11·50	2·00	2·00	15·50	....	8·00	£22/5/6 (PW)
Orchard Manure	36	do.	do. do. do.		3·50	.	..	12·50	2·00	2·25	16·75	....	5·00	£21/2/0 (PW)
Garden Fertilisers	37	do. ..	do. do. do.		3·50	.	....	11·50	2·00	2·00	15·50	....	8·00	£22/5/6 (PW)
Potato Manure "A"	51	C.S.M.L.	do. do. do.	. .	2·50			13·25	2·25	2·50	18·00	..	5·00	£19/18/0 (PJW)
Potato Manure "B"	52	do.	do. do. do.	.	3·50	..	..	12·50	2·00	2·25	16·75	....	5·00	£21/4/0 (PJW)
Potato Manure "E"	54	do.	do. do. do.	.	3·50	..	..	11·50	2·00	2·00	15·50	....	8·00	£22/7/8 (PJW)
Potato Manure "E2" ..	55	do.	do. do. do.	.	3·50	..	.	11·50	2·00	2·00	15·50	8·00	....	£24/18/6 (GW)
Orchard Manure ..	56	do.	do. do. do.		3·50	..	.	12·50	2·00	2·25	16·75	....	5·00	£21/4/0 (PJW)
Garden Fertiliser	57	do.	do. do. do.		3·50	....	.	11·50	2·00	2·00	15·50	....	8·00	£22/7/8 (PJW)
Tobacco Fertiliser	58	do.	do. do. do.	.	3·00	.		8·25	1·50	1·50	11·25	15·00	....	£28/15/0 (PJW)
Tomato Manure ..	60	do.	do. do. do.	....	3·50	.	. .	10·25	1·50	2·00	13·75	10·00	....	£26/7/0 (GW)
N.P.K.—13 : 13 : 20	62	do. ..	do. do. do.	5·70	7·30	..	..	5·00	8·00	....	13·00	....	20·00	£51/10/0(PW)(PJW)
Potato Manure "A"	75	A in diamond	Albany Superphosphate Co. Pty. Ltd.	....	2·50	..	..	13·25	2·25	2·50	18·00	....	5·00	£19/18/0 (AW)
Potato Manure "B"	76	do. ..	do. do. do.		3·50	..	.	12·50	2·00	2·25	16·75	....	5·00	£21/4/0 (AW)
Potato Manure "E"	78	do.	do. do. do.		3·50	..	.	11·50	2·00	2·00	15·50	....	8·00	£22/7/6 (AW)
Orchard Manure	79	do.	do. do. do.		3·50	..	.	12·50	2·00	2·25	16·75	....	5·00	£21/4/0 (AW)
Garden Fertiliser	80	do.	do. do. do.		3·50	....	..	11·50	2·00	2·00	15·50	....	8·00	£22/7/6 (AW)
Potato Manure "A"	95	Cresco	Cresco Fertilisers (W.A.) Ltd.	.	2·50	....		13·25	2·25	2·50	18·00	....	5·00	£19/16/6 (PW)
Potato Manure "B"	96	do.	do. do. do.	.	3·50	..	..	12·50	2·00	2·25	16·75	....	5·00	£21/2/0 (PW)
Potato Manure "E"	98	do.	do. do. do.	.	3·50	..	..	11·50	2·00	2·00	15·50	....	8·00	£22/5/6 (PW)
Orchard Manure	99	do.	do. do. do.		3·50			12·50	2·00	2·25	16·75	....	5·00	£21/2/0 (PW)
Potato Manure "E"	115	David Gray's	David Gray & Co. Ltd.		3·50			11·50	2·00	2·00	15·50	....	8·00	Packets
Orchard Manure	125	P.P.	Picton Produce Pty. Ltd.	..	(2·75)			7·50	....	14·00	21·50	....	2·00	£26/0/0 (PJW)
Potato Manure	126	do.	do. do. do.	..	(2·75)			7·50	....	14·00	21·50	....	2·00	£26/0/0 (PJW)
Top Dressing Fertiliser	127	do.	do. do. do.	..	(2·75)			7·50	....	14·00	21·50	....	2·00	£26/0/0 (PJW)
Garden Fertiliser	128	do.	do. do. do.	.	(2·75)	.		7·50	....	14·00	21·50	....	2·00	£26/0/0 (PJW)
Potato "E" Manure	140	Best	William J. Pascoe & Son	.	3·50			11·50	2·00	2·00	15·50	....	8·00	Packets
Potato "A" Manure	141	do.	do. do. do.	....	2·50	.	.	13·25	2·25	2·50	18·00	....	5·00	Packets
No. 1 Fertiliser	147	Apex	E. J. Fry Pty. Ltd.	....	(5·00)	.	.	3·00	1·50	4·50	9·00	....	2·00	£37/0/0 (PW)
Lawn Fertiliser	149	do.	do. do.		(5·00)	.	.	3·00	1·50	4·50	9·00	....	2·00	£37/0/0 (PW)
Rose Fertiliser	156	Symonds	E. Symonds		4·25	....	..	4·00	3·50	4·50	12·00	....	3·75	Packets
Potatoe Manure "B"	158	do.	do.	.	3·50	....	.	12·50	2·00	2·25	16·75	....	5·00	Packets
Potato Manure "E"	159	do.	do.	.	3·50	..	.	11·50	2·00	2·00	15·50	....	8·00	Packets
Lawn Fertiliser	165	do.	do.	. .	4·25	....	.	4·00	3·50	4·50	12·00	....	3·75	Packets
Potato Manure "A"	174	Blue Cross	Agricultural Products Co.		2·50		..	13·25	2·25	2·50	18·00	....	5·00	Packets
Potato Manure "E"	175	do.	do. do. do.	....	3·50	.	..	11·50	2·00	2·00	15·50	....	8·00	Packets
Special Garden Fertiliser	179	do.	do. do. do.	....	4·00		....	3·00	3·00	6·00	12·00	2·50	....	Packets

(PW) Perth Works. (GW) Geraldton Works. (AW) Albany Works. (PJW) Picton Junction Works.

Name of Fertiliser	Reg. No.	Registered Brand	By Whom Registered	Nitrogen (N) as				Phosphoric Anhydride (P_2O_5) as				Potash (K_2O) as		Cash Price per ton at Works (W) or on Rails at Perth (P)
				Nitrate	Ammonia	Blood and Bone	Urea	Water Soluble	Citrate Soluble	Acid Soluble	Total	Sulphate	Muriate	
A. MINERAL—*Ctd.* **5. Nitrogen, Phosphoric Anhydrine and Potash** —*Continued.*				%	%	%	%	%	%	%	%	%	%	
Bulb-O	180	do.	do. do. do.	....	....	2·25	....	3·00	3·50	3·50	10·00	....	4·50	Packets
Potato Manure "E"	197	Evergreen Fertilisers	Voldemars Ertners	....	3·50	....	....	11·50	2·00	2·00	15·50	....	8·00	Packets
Garden Manure	198	do.	do. do.	....	3·50	....	....	11·50	2·00	2·00	15·50	....	8·00	Packets
Lawn Manure	200	do.	do. do.	....	3·50	....	....	11·50	2·00	2·00	15·50	....	8·00	Packets
Uraphos	211	G.S. & S.	Gardening Service & Supplies	24·00 as Urea and Ammonia				5·00	1·00	1·00	7·00	4·00	....	Packets
Uraphos 3	212	do.	do. do. do.	14·00 as Urea and Ammonia				2·50	0·50	0·50	3·50	2·00	....	Packets
All Purpose	213	do.	do. do. do.	....	(1·75)	....	....	3·00	0·65	0·65	4·30	2·50	....	Packets
Potato Manure "E"	223	Wesfarmers	Westralian Farmers Co-op. Ltd.	....	3·50	....	....	11·50	2·00	2·00	15·50	8·00	....	Packets
Potato Manure "E"	233	Boans	Boans Ltd.	....	3·50	....	....	11·50	2·00	2·00	15·50	8·00	....	Packets
Foli 8	248	George Warners	George C. Warner Laboratories Pty. Ltd.	....	20·00	....	....	20·00	....	....	20·00	20·00 as Nitrate		Packets
Harold Darke Special Fertiliser	249	do.	do. do. do.	....	22·00	....	....	10·00	....	....	10·00	21·00 as Nitrate		Packets
Gard-N-Tabs	250	do.	do. do. do.	....	14·00	....	....	19·00	....	....	19·00	24·00 as Nitrate		Packets
Flora-Gro-Water Soluble Liquid Manure	252	Lane's	Lane's (W.A.) Pty. Ltd.	....	....	....	24·00	12·00	....	....	12·00	....	16·00	Packets
Bumpercrop	255	do.	do. do.	6·50	6·50	....	....	5·20	7·80	....	13·00	....	21·00	£59/10/0 (P)
6. Phosphoric Anhydride and Potash														
Super and Potash	12	ML in diamond	Cuming Smith Mt. Lyell Farmers Fertilisers Ltd.	....	....	....	....	14·00	2·50	2·50	19·00	....	9·00	£16/18/6 (PW)
Do. do.	31	Sickle	do. do. do.	....	....	....	....	14·00	2·50	2·50	19·00	....	9·00	£16/18/6 (PW)
Do. do.	50	C.S.M.L.	do. do. do.	....	....	....	....	14·00	2·50	2·50	19·00	....	9·00	£16/18/6 (PJW)
Do. do.	74	A in diamond	Albany Superphosphate Co. Pty. Ltd.	....	....	....	....	14·00	2·50	2·50	19·00	....	9·00	£16/18/6 (AW)
Do. do.	92	Cresco	Cresco Fertilisers (W.A.) Ltd.	....	....	....	....	14·00	2·50	2·50	19·00	....	9·00	£16/18/6 (PW)

Name of Fertiliser	Reg. No.	Registered Brand	By Whom Registered	Nitrogen (N) as				Phosphoric Anhydride P_2O_5 as				Potash (K_2O) as		Minor Elements								Cash price per ton at Works (W) or on Rails, Perth (P)
				Nitrate	Ammonia	Blood and Bone	Urea	Water Sol.	Citrate Sol.	Acid Sol.	Total	Sulphate	Muriate	(Cu)	(Zn)	(Co)	(Mn)	(Mg)	(Fe)	(Mo)	(B)	(Al)	
A. MINERAL—*Ctd.* **7. Phosphoric Anhydride and Minor Elements**				%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
Super and Copper Ore	9	ML in diamond	Cuming Smith Mt. Lyell Farmers Fertilisers Ltd.	....	....	....	....	13·00	2·25	3·75	19·00	....	....	1·25	....	....	....	....	....	....	....	....	£16/6/6 (PW)
Super, Copper Ore and Zinc	10	do.	do. do.	....	....	....	....	12·75	2·25	3·50	18·50	....	....	1·25	1·15	....	....	....	....	....	....	....	£17/7/0 (PW)
Super and Zinc	11	do.	do. do.	....	....	....	....	16·50	2·75	3·25	22·50	....	....	....	1·15	....	....	....	....	....	....	....	£14/3/0 (PW)

Super and Copper Ore	23	Sickle	do.	do.	....	....	....	....	13·00	2·25	3·75	19·00	....	....	1·25	....	....	....	....	....	....	....	....	£16/6/6 (PW)
Super, Copper Ore and Zinc	24	do.	do.	do.	....	....	....	....	12·75	2·25	3·50	18·50	....	....	1·25	1·15	....	....	....	....	....	....	....	£17/7/0 (PW)
Super, Copper, Zinc and Cobalt	25	do.	do.	do.	....	....	....	....	12·75	2·25	3·50	18·50	....	....	1·25	1·15	Trace	....	....	....	....	....	....	£19/0/0 (PW)
Super, Copper, Zinc and Molybdenum	26	do.	do.	do.	....	....	....	....	12·75	2·25	3·50	18·50	....	....	1·25	1·15	....	....	....	....	Trace	....	....	£18/12/0 (PW)
Super and Zinc	27	do.	do.	do.	....	....	....	....	16·50	2·75	3·25	22·50	....	....	....	1·15	....	....	....	....	....	....	....	£14/3/0 (PW)
Super and Manganese	28	do.	do.	do.	....	....	....	....	14·50	2·50	2·50	19·50	....	....	....	....	....	3·80	....	....	....	....	....	£24/3/6 (PW)
Super and Molybdenum	29	do.	do.	do.	....	....	....	....	17·00	3·00	3·00	23·00	....	....	....	....	....	....	....	....	Trace	....	....	£14/8/6 (PW)
Super and Cobalt	30	do.	do.	do.	....	....	....	....	17·00	3·00	3·00	23·00	....	....	....	....	Trace	....	....	....	....	....	....	£14/16/0 (PW)
Super and Copper Ore	42	C.S.M.L.	do.	do.	....	....	....	....	13·00	2·25	3·75	19·00	....	....	1·25	....	....	....	....	....	....	....	....	£16/6/6 (PJW) (GW)
Super, Copper Ore and Zinc	43	do.	do.	do.	....	....	....	....	12·75	2·25	3·50	18·50	....	....	1·25	1·15	....	....	....	....	....	....	....	£17/7/0 (PJW) (GW)
Super, Copper, Zinc and Cobalt	44	do.	do.	do.	....	....	....	....	12·75	2·25	3·50	18·50	....	....	1·25	1·15	Trace	....	....	....	....	....	....	£19/0/0 (PJW)
Super, Copper, Zinc and Molybdenum	45	do.	do.	do.	....	....	....	....	12·75	2·25	3·50	18·50	....	....	1·25	1·15	....	....	....	....	Trace	....	....	£18/12/0 (PJW)
Super and Zinc	46	do.	do.	do.	....	....	....	....	16·50	2·75	3·25	22·50	....	....	....	1·15	....	....	....	....	....	....	....	£14/3/0 (PJW) (GW)
Super and Manganese	47	do.	do.	do.	....	....	....	....	14·50	2·50	2·50	19·50	....	....	....	....	....	3·80	....	....	....	....	....	£24/3/6 (PJW)
Super and Molybdenum	48	do.	do.	do.	....	....	....	....	17·00	3·00	3·00	23·00	....	....	....	....	....	....	....	....	Trace	....	....	£14/8/6 (PJW) (GW)
Super and Cobalt	49	do.	do.	do.	....	....	....	....	17·00	3·00	3·00	23·00	....	....	....	....	Trace	....	....	....	....	....	....	£14/16/0 (PJW)
Super and Copper Ore	66	A in diamond	Albany Superphosphate Co. Pty. Ltd.		.	.	.	.	13·00	2·25	3·75	19·00	.	.	1·25	....	....	....	.	.	....	....	....	£16/6/6 (AW)
Super, Copper Ore and Zinc	67	do.	do.	do.	....	....	....	....	12·75	2·25	3·50	18·50	....	....	1·25	1·15	....	....	....	....	....	....	....	£17/7/0 (AW)
Super, Copper, Zinc and Cobalt	68	do.	do.	do.	....	....	....	....	12·75	2·25	3·50	18·50	....	....	1·25	1·15	Trace	....	....	....	....	....	....	£19/0/0 (AW)
Super, Copper, Zinc and Molybdenum	69	do.	do.	do.	....	....	....	....	12·75	2·25	3·50	18·50	....	....	1·25	1·15	....	....	....	....	Trace	....	....	£18/12/0 (AW)
Super and Zinc	70	do.	do.	do.	....	....	....	....	16·50	2·75	3·25	22·50	....	....	....	1·15	....	....	....	....	....	....	....	£14/3/0 (AW)
Super and Manganese	71	do.	do.	do.	....	....	....	....	14·50	2·50	2·50	19·50	....	....	....	....	....	3·80	....	....	....	....	....	£24/3/6 (AW)
Super and Molybdenum	72	do.	do.	do.	....	....	....	....	17·00	3·00	3·00	23·00	....	....	....	....	....	....	....	....	Trace	....	....	£14/8/6 (AW)
Super and Cobalt	73	do.	do.	do.	....	....	....	....	17·00	3·00	3·00	23·00	....	....	....	....	Trace	....	....	....	....	....	....	£14/16/0 (AW)
Super and Copper Ore	84	Cresco	Cresco Fertilisers (W.A.) Ltd.		....	....	....	....	13·00	2·25	3·75	19·00	....	....	1·25	....	....	....	....	....	....	....	....	£16/6/6 (PW)
Super and Manganese	85	do.	do.	do.	....	....	....	....	14·50	2·50	2·50	19·50	....	....	....	....	....	3·80	....	....	....	....	....	£24/3/6 (PW)
Super and Zinc Oxide	86	do.	do.	do.	....	....	....	....	16·50	2·75	3·25	22·50	....	....	....	1·15	....	....	....	....	....	....	....	£14/3/0 (PW)
Super and Molybdenum	87	do.	do.	do.	....	....	....	....	17·00	3·00	3·00	23·00	....	....	....	....	....	....	....	....	Trace	....	....	£14/8/6 (PW)
Super and Cobalt	88	do.	do.	do.	....	....	....	....	17·00	3·00	3·00	23·00	....	....	....	....	Trace	....	....	....	....	....	....	£14/16/0 (PW)
Super, Copper, Zinc and Cobalt	89	do.	do.	do.	....	....	....	....	12·75	2·25	3·50	18·50	....	....	1·25	1·15	Trace	....	....	....	....	....	....	£19/0/0 (PW)
Super, Copper and Zinc	90	do.	do.	do.	....	....	....	....	12·75	2·25	3·50	18·50	....	....	1·25	1·15	....	....	....	....	....	....	....	£17/7/0 (PW)
Super, Copper, Zinc and Molybdenum	91	do.	do.	do.	....	....	....	....	12·75	2·25	3·50	18·50	....	....	1·25	1·15	....	....	....	....	Trace	....	....	£18/12/0 (PW)
Super, Copper, Zinc and Manganese	93	do.	do.	do.	....	....	....	....	11·75	2·50	2·25	16·50	....	....	1·10	1·10	....	2·25	....	....	....	....	....	£23/13/6 (PW)
Super and Copper Sulphate	94	do.	do.	do.	....	....	....	....	16·00	2·75	2·75	21·50	....	....	1·25	....	....	....	....	....	....	....	....	£19/12/0 (PW)
8. Nitrogen, Phosphoric Anhydride and Minor Elements																									
Hydrangea Blueing Tonic	181	Blue Cross	Agricultural Products Co.		.	.	2·00	. .	....	....	....	2·00	. .	.	....	2·00	....	....	.	3·50	(8) 8·90	....	3·20	Packets

(PW) Perth Works. (GW) Geraldton Works. (AW) Albany Works. (PJW) Picton Junction Works.

FERTILISERS—continued

Name of Fertiliser	Reg. No.	Registered Brand	By Whom Registered	Nitrogen (N) as				Phosphoric Anhydride P_2O_5 as				Potash (K_2O) as		Minor Elements									Cash price per ton at Works (W) or on Rails, Perth (P)
				Nitrate	Ammonia	Blood and Bone	Urea	Water Sol.	Citrate Sol.	Acid Sol.	Total	Sulphate	Muriate	(Cu)	(Zn)	(Co)	(Mn)	(Mg)	(Fe)	(Mo)	(B)	(Al)	
				%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
A. MINERAL—*Ctd.* 9. Nitrogen, Phosphoric Anhydride, Potash and Minor Elements																							
Lawn Fertiliser	19	ML in diamond	Cuming Smith Mt. Lyell Farmers Fertilisers Ltd.	....	11·00			4·00	0·50	0·50	5·00	7·50	....	Trace	Trace				..			.	£33/5/0 (PW)
Lawn Fertiliser	38	Sickle	do. do.	....	11·00	....	....	4·00	0·50	0·50	5·00	7·50	....	Trace	Trace	....	....	....	....	....	....	....	£33/5/0 (PW)
Tobacco Fertiliser No. 2	59	C.S.M.L.	do. do.	..	3·00			7·50	1·50	1·50	10·50	15·00	....	Trace	Trace				.	.	.		£29/5/0 (PJW)
Special Mixture "363"	100	Cresco	Cresco Fertilisers (W.A.) Ltd.	..	12·00		..	3·25	0·50	0·50	4·25	.	11·50	0·10	0·30	...	.	. .	.		.		£34/18/2 (PW)
Citrus Manure	103	David Gray's	David Gray & Co. Ltd.	..	5·00		.	3·50	3·50	2·00	9·00	.	5·00	0·05	0·05	..	0·05	0·05	0·05	0·05	0·05	(Ca) 3·25	Packets
Special Garden Fertiliser	104	do.	do. do.	....	5·00	....	....	3·50	3·50	2·00	9·00	....	5·00	0·05	0·05	....	0·05	0·05	0·05	0·05	0·05	(Ca) 3·25	Packets
Rose Manure	116	do.	do. do.	....	5·00	..		3·50	3·50	2·00	9·00	.	5·00	0·05	0·05	..	0·05	0·05	0·05	0·05	0·05	(Ca) 3·25	Packets
Lawn Fertiliser	117	do.	do. do.	....	5·00	..	.	3·50	3·50	2·00	9·00		5·00	0·05	0·05		0·05	0·05	0·05	0·05	0·05	(Ca) 3·25	Packets
Rose Fertiliser	120	Clarksons	Clarksons (W.A.) Pty. Ltd.	....	5·00		..	3·50	3·50	2·00	9·00	.	5·00	0·05	0·05	. .	0·05	0·05	....	0·05	0·05	(Ca) 3·25	Packets
Fertiliser	121	do.	do. do.	....	5·00		. .	3·50	3·50	2·00	9·00	. .	5·00	0·05	0·05		0·05	0·05	....	0·05	0·05	(Ca) 3·25	Packets
Nitrophoska Red ..	129	B.A.S.F.	Henry H. York & Co. Pty. Ltd.	0·60 as Ammonium Nitrate 5·40 as Potassium Nitrate 1·60 as Mono/Di-ammonium Phosphate 5·40 as Ammonium Chloride				5·40 as Mono/Di-ammonium Phosphate 7·60 as Dicalcium Phosphate				18·10 as Potassium Nitrate 1·90 as Potassium Chloride		0·002 to 0·003	0·011 to 0·013	....	0·002 to 0·003	0·21	....	·0001	0·001 to 0·005	....	£55/10/0 (P) and packets
Nitrophoska Green	130	do.	do. do.	4·20 as Ammonium Nitrate 4·50 as Potassium Nitrate 1·90 as Mono/Di-ammonium Phosphate 4·50 as Ammonium Chloride				6·60 as Mono/Di-ammonium Phosphate 8·40 as Dicalcium Phosphate				15·00 as Potassium Nitrate		0·002 to 0·003	0·011 to 0·013	..	0·002 to 0·003	0·31	....	·0001	0·001 to 0·005	.	£59/10/0 (P)
Nitrophoska Yellow	131	do. ..	do. do.	9·80 as Ammonium Sulphate Nitrate 3·30 as Potassium Nitrate 1·90 as Mono/Di-ammonium Phosphate				6·60 as Mono/Di-ammonium Phosphate 8·40 as Dicalcium Phosphate				11·10 as Potassium Nitrate 0·90 as Potassium Sulphate		0·002 to 0·003	0·011 to 0·013	.	0·002 to 0·003	0·31	. .	·0001	0·001 to 0·005	.	£55/10/0 (P)
Nitrophoska Blue....	132	do.	do. do.	7·90 as Ammonium Sulphate Nitrate 2·60 as Potassium Nitrate 1·50 as Mono/Di-ammonium Phosphate				5·00 as Mono/Di-ammonium Phosphate 7·00 as Dicalcium Phosphate				8·90 as Potassium Nitrate 10·10 as Potassium Sulphate		0·002 to 0·003	0·011 to 0·013		0·002 to 0·003	1·07	....	·0001	0·001 to 0·005	...	£55/10/0 (P)

Nitrophoska Grey....	133	do.	do. do.	0·50 as Ammonium Nitrate 5·10 as Potassium Nitrate 0·90 as Mono/Di-ammonium Phosphate 5·10 as Ammonium Chloride				3·00 as Mono/Di-ammonium Phosphate 5·50 as Dicalcium Phosphate				17·00 as Potassium Nitrate		0·002 to 0·003	0·011 to 0·013	....	0·002 to 0·003	0·31	....	·0001	0·001 to 0·005	....	£55/10/0 (P)
Rose Manure	142	Best	William J. Pascoe & Son	....	....	3·00	....	5·00	2·00	6·00	13·00	....	9·00	Trace	Trace	....	Trace	Trace	....	Trace	Trace	....	Packets
Lawn Food	145	Berrys	Berry Hardware	....	12·00	....	....	3·25	0·50	0·50	4·25	....	11·50	0·10	0·30	....	....	....	....	....	....	....	£2/15/7 per 160 lb.
Rose Manure	148	Apex	E. J. Fry Pty. Ltd.	....	....	3·00	....	5·00	2·00	6·00	13·00	....	9·00	0·03	0·015	....	0·02	0·05	....	0·005	0·003	....	£40/10/0 (PW)
Lawn Manure	176	Blue Cross	Agricultural Products Co.	....	4·00	....	....	1·00	1·00	6·00	8·00	2·00	....	PPM 45	PPM 45	....	PPM 100	PPM 145	PPM 160	PPM 2	PPM 6	PPM 45	Packets
Citrus Manure	177	do.	do. do.	....	4·00	....	....	2·00	5·00	2·00	9·00	3·00		PPM 250	PPM 250	....	PPM 550	PPM 750	PPM 1000	PPM 12	PPM 35	250	Packets
Rose Bush Fertiliser	178	do.	do. do.	....	4·00	....	....	2·00	2·00	4·00	8·00	3·00	....	PPM 45	PPM 45	....	PPM 100	PPM 145	PPM 160	PPM 2	PPM 6	45	Packets
Cardex	182	do.	do. do.	....	....	5·00	....	....	2·00	....	2·00	....	2·50	0·40	0·60	....	....	0·50	0·50	....	....	0·40	Packets
Boost Crop	183	do.	do. do.	....	4·40	....	....	1·00	2·00	6·00	9·00	3·00		PPM 90	PPM 90	....	PPM 200	PPM 275	PPM 320	PPM 4	PPM 13	PPM 90	Packets
Fertosol	184	do.	do. do.	....	7·00	....	23·00	16·00	....	....	16·00	8·00 as Nitrate and Sulphate		PPM 1000	PPM 100	....	PPM 120	....	PPM 500	PPM 50	PPM 50	....	Packets
Pot Plant Pellets	189	do.	do. do.	....	....	....	8·20	8·20	....	....	8·20	9·00	....	Trace	Trace	....	Trace	....	....	....	....	....	Packets
Daphne Mix	191	Keogh's	Wilcox Mofflin Ltd.	....	6·10		....	14·00	....	0·60	14·60	3·20	....	Trace	Trace	....	....	Trace	Trace	....	....	(CaO) 18·50	Packets
Rose Food	192	do.	do. do.	....	5·70		....	7·50	....	0·30	7·80	10·70	....	Trace	....	....	Trace	Trace	Trace	Trace	Trace	(CaO) 9·40	Packets
Do.	199	Evergreen Fertilisers	Voldemars Ertners....	....	9·50		....	1·95	1·10	3·50	6·55	....	6·60	0·06	0·18	....	....	....	....	....	....	....	Packets
Special Lawn Manure	201	do.	do. do.	....	12·00	....	....	3·25	0·50	0·50	4·25	....	11·50	....	0·10	0·30	....	....	....	....	....	....	Packets
No. 2 Complete Plant Food	206	Hortico	Horticultural Industries Pty. Ltd.	....	2·00	1·00	....	11·00	1·00	3·00	15·00	3·00	....	Trace	Trace	....	Trace	Trace	Trace	Trace	Trace	....	Packets
No. 3 Complete Plant Food	207	do.	do. do.	....	6·00	1·00	....	2·00	3·00	2·00	7·00	14·00	....	Trace	Trace	....	Trace	Trace	Trace	Trace	Trace	....	Packets
No. 4 Soluble Lawn Food	208	do.	do. do.	....	16·00	....	....	1·00	....	....	1·00	8·00	....	Trace	....	....	Trace	Trace	Trace	....	....	....	£53/10/0 (W) £70/0/0 (P)
Rhodo-Daphne Tonic	210	do.	do. do.	....	3·50		....	7·00	2·80	3·70	13·50	7·50	....	Trace	Trace	....	Trace	Trace	Trace	Trace	Trace	....	£33/0/0 (W) £50/0/0 (P)
Nutrifert	229	Wesfarmers	Westralian Farmers Co-op. Ltd.	....	5·20		....	5·10	2·00	4·00	11·10	....	4·60	Trace	Trace	....	Trace	Trace	Trace	Trace	Trace	Trace	Packets
Rose Manure	230	do.	do. do.	....	3·80		....	6·30	1·80	3·70	11·80	....	7·10	Trace	Trace	....	Trace	Trace	Trace	Trace	Trace	Trace	Packets
Citrus Manure	231	do.	do. do.	....	5·20		....	5·10	2·00	4·00	11·10	....	4·60	Trace	Trace	....	Trace	Trace	Trace	Trace	Trace	Trace	Packets
Lawn Manure	232	do.	do. do.	....	5·90		....	5·10	2·00	4·00	11·10	....	2·30	Trace	Trace	....	Trace	Trace	Trace	Trace	Trace	Trace	Packets
Specially Prepared Lawn Manure	238	Boans	Boans Ltd.	....	12·00	....	....	3·25	0·50	0·50	4·25	11·50	....	0·10	0·30	....	....	....	....	....	....	....	Packets
Complete Plant Food	247	Fosterite	H. S. Emerson	....	4·40		....	2·00	1·00	6·00	9·00	2·00		PPM 90	PPM 90	....	PPM 200	PPM 275	PPM 320	PPM 4	PPM 13	PPM 90	Packets
365	258	Dawsons	Dawson & Harrison Pty. Ltd.	....	8·2	....	....	3·4	0·6	0·6	4·6	....	3·8	0·12	0·06	(Calcim sulphate 33·2%)						....	£39/0/0 (W)
Lawn Food	259	do.	do. do.	....	11·5	....	....	4·75	0·75	0·75	6·25	....	6·5	0·4	0·65	....	....	....	....	....	....	....	£33/10/4 (W)
" Vigoro " Plant Food	260	do.	do. do.	....	6·04		....	2·68	2·26	8·76	13·70	5·85	....	0·4	0·65	....	....	....	....	....	....	....	£45/0/0 (W)
Rose Food	262	do.	do. do.	....	6·04		....	2·68	2·26	8·76	13·70	5·85	....	0·4	0·65	....	....	....	....	....	....	....	£45/0/0 (W)
10. Nitrogen and Minor Elements																						(CaO)	
Nitro-Green	134	B.A.S.F.	Henry H. York & Co. Pty. Ltd.	10·46	10·27	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	36·50	£40/0/0 (P)
Fe-Ro-Chelate	185	Blue Cross	Agricultural Products Co.	....	....	....	15·00	....	....	....	....	....	....	....	....	....	....	....	3·00	....	....	....	Packets

(PW) Perth Works. (GW) Geraldton Works. (AW) Albany Works. (PJW) Picton Junction Works.

Name of Fertiliser	Reg. No.	Registered Brand	By Whom Registered	Nitrogen (N) as				Phosphoric Anhydride P_2O_5 as				Potash (K_2O) as		Minor Elements								Cash price per ton at Works (W) or on Rails, Perth (P)
				Nitrate	Ammonia	Blood and Bone	Urea	Water Sol.	Citrate Sol.	Acid Sol.	Total	Sulphate	Muriate	(Cu)	(Zn)	(Co)	(Mn)	(Mg)	(Fe)	(Mo)	(B)	(Al)	
A. MINERAL—*Ctd.*				%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
11. Trace Elements																							
Copper Sulphate	106	David Gray's	David Gray & Co. Ltd.	....	....	....	....	....	....	....	....	....	....	39·50	....	....	....	....	....	....	....	....	Packets
Minorels	186	Blue Cross	Agricultural Products Co.	....	....	....	....	....	....	....	....	....	....	1·00	1·00	(CaO) 9·00	2·25	3·30	4·00	0·05	0·15	1·00	Packets
Trace Elements	246	Fosterite	H. S. Emerson	....	....	....	....	....	....	....	....	....	....	1·00	1·00	(CaO) 9·00	....	3·30	4·00	0·50	0·15	1·00	Packets
Ess-Min-El	257	Lane's	Lane's (W.A.) Pty. Ltd.	....	....	....	....	....	....	....	....	....	....	1·40	0·23	....	2·70	5·50	5·00	0·20	0·11	....	Packets
Copper Ore	263	Green Gro	Barrow Linton Pty. Ltd.	....	....	....	....	....	....	....	....	....	....	8·00	....	....	....	....	....	....	....	....	£34/0/0 (W)
Zinc Oxide	264	do.	do. do.	....	....	....	....	....	....	....	....	....	....	....	55·60	....	....	....	....	....	....	....	£77/0/0 (W)
Copper Zinc Premix	265	do.	do. do.	....	....	....	....	....	....	....	....	....	....	6·60	9·20	....	....	....	....	....	....	....	£45/0/0 (W)
12. Liquid Fertilisers														PPM	PPM		PPM						
Liquid Fertiliser	114	David Gray's	David Gray & Co. Ltd.	9·00	....	....	....	13·10	....	....	13·10	4·00 as Nitrate		50	50	....	50	....	....	....	....	....	Bottles
Liquid Manure	150	Watkins	The J. R. Watkins Co.	....	22·00	....	....	12·00	....	....	12·00	14·00	....	Trace	Trace	....	Trace	Trace	Trace	Trace	Trace	....	Packets
Liquid Fertiliser	187	Blue Cross	Agricultural Products Co.	....	....	....	6·50	5·00	....	....	5·00	3·00 as Nitrate		....	....	....	....	....	....	....	....	....	Bottles
Liquid Manure	193	Keogh's	Wilcox Mofflin Ltd.		1·70		....	3·70	0·10	....	3·80	2·00	....	....	....	....	....	....	....	....	....	(CaO) 1·25	Bottles
Do.	204	Aquasol	Horticultural Industries Pty. Ltd.		20·00	....	....	12·00	....	....	12·00	16·00	....	Trace	Trace	....	Trace	Trace	Trace	Trace	Trace	(CaO) 1·00	Bottles
Concentrated Fertiliser	214	Spring	F. H. Faulding & Co. Ltd.	....	7·50	....	....	5·00	....	....	5·00	4·00	....	....	....	....	....	....	....	....	....	....	Bottles
Liquid Manure	220	Wesfarmers	Westralian Farmers Co-op. Ltd.	....	10·00	....	....	5·00	....	....	5·00	4·50	....	Trace	....	....	Trace	Trace	Trace	Trace	....	....	Bottles
Indoor Plant Food	221	do.	do. do.	....	5·00	....	....	2·50	....	....	2·50	2·00	....	Trace	....	....	Trace	Trace	Trace	Trace	....	....	Bottles
Liquid Fertiliser and Plant Food	253	Lane's	Lane's (W.A.) Pty. Ltd.	....	....	....	8·60	8·60	....	....	8·60	4·00	....	0·25	0·12	....	0·25	0·20	0·40	0·077	0·50	....	

Name of Fertiliser	Reg. No.	Registered Brand	By Whom Registered	Nitrogen (N) as				Phosphoric Anhydride (P_2O_5) as				Potash (K_2O) as		Cash Price per ton at Works (W) or on Rails at Perth (P)
				Nitrate	Ammonia	Blood and Bone	Urea	Water Soluble	Citrate Soluble	Acid Soluble	Total	Sulphate	Muriate	
B. ORGANIC FERTILISERS				%	%	%	%	%	%	%	%	%	%	
1. Blood and Bone														
Blood and Bone	113	David Gray's	David Gray & Co. Ltd.	....	....	5·00	....	....	2·00	8·00	10·00	Fine Material a	100	Packets
Do.	119	N.Z.	Burridge & Warren Pty. Ltd.	....	....	7·50	....	....	8·70	1·30	10·00	b	55	
Do.	122	Eclipse	The West Australian Meat Export Works	....	....	6·00	....	....	3·00	9·00	12·00	a	100	£44/0/0 (P)
Do.	124	P.P.	Picton Produce Pty. Ltd.	....	....	5·00	....	....	5·00	10·00	15·00	b	55	£31/0/0 (W)
Do.	143	Best	William J. Pascoe & Son	....	....	6·00	....	....	4·00	11·00	15·00	a	100	£36/0/0 (PJW)
												b	55	
												a	100	Packets
												b	55	

Do.	146	Apex	E. J. Fry Pty. Ltd.	....	....	6·00	....	....	4·00	11·00	15·00	a	100		£39/17/6 (W)
												b	55		
Do.	154	Sound	Cockburn Sound Fertilisers	....	....	5·25	....	....	2·50	6·50	9·00	a	100		£32/0/0 (W)
												b	55		
Do.	155	Wyndham	Wyndham Freezing, Canning & Meat Export Works	....	....	6·00	....	....	5·50	9·50	15·00	a	100		£25/5/0 (W)
												b	55		£36/3/6 (P)
Do.	164	Symonds	E. Symonds	....	....	5·25	....	....	2·50	6·50	9·00	a	100		Packets
												b	55		
Blood & Bone Fertiliser	166	Blue Cross	Agricultural Products Co.	....	....	5·00	....	....	2·00	7·00	9·00	a	100		Packets
												b	55		
Do.	190	T.B. & S. in diamond	Thomas Borthwick & Sons (A/Asia) Ltd.	....	....	5·75	....	....	6·75	5·25	12·00	a	100		£30/0/0 (AW)
												b	55		£32/0/0 (P)
Do.	202	Evergreen Fertilisers	Voldemars Ertners	....	....	5·00	....	....	2·00	7·15	9·15	a	100		Packets
												b	55		
Do.	219	Wesfarmers	Westralian Farmers Co-op. Ltd.	....	....	5·00	....	....	2·00	7·15	9·15	a	100		£36/0/0 (P)
												b	55		
Do.	237	Boans	Boans Ltd.	....	....	6·00	....	....	4·00	11·00	15·00	a	100		Packets
												b	55		
Do.	242	Excelsior	J. Kitchen & Sons Pty. Ltd.	....	....	7·20	....	....	6·00	7·00	13·00	a	100		£30/0/0 (Melb.)
												b	55		
Do.	243	Kitchens	do. do. do.	....	....	6·80	....	....	9·00	5·00	14·00	a	100		£30/0/0 (Melb.)
												b	55		
Do.	244	Mars	Fergusons (By Products) Pty. Ltd.	....	....	6·00	....	....	3·50	11·50	15·00	a	100		£31/5/0 (W)
												b	55		
Do.	245	Hortico	Elder Smith & Co. Ltd.	....	....	5·00	....	....	6·00	11·00	17·00	a	100		£42/10/0 (P)
												b	55		
2. Animal Fertilisers												Fine Material			
Bone Dust	102	Fertillo	David Gelatine (Aust.) Pty. Ltd.	....	....	1·00	....	....	8·00	22·00	30·00	a	100		£30/0/0 (P)
												b	55		
Garden Fertiliser	123	Eclipse	The West Australian Meat Export Works	....	....	4·00	....	1·00	2·00	3·00	6·00	a	100		£25/0/0 (W)
												b	55		
Animal Fertiliser	167	Blue Cross	Agricultural Products Co.	....	....	3·50	....	....	3·00	9·00	12·00	....	....		Packets
Bone Dust	168	do.	do. do. do.	....	....	3·00	....	....	2·00	7·00	9·00	....	....		Packets
No. 1 Complete Plant Food	205	Hortico	Horticultural Industries Pty. Ltd.	....	....	4·00	....	....	7·00	9·00	16·00	4·00	Trace Minor Elements		Packets
Meat Meal Fertiliser	261	Dawsons	Dawson & Harrison Pty. Pty.	....	....	4·59	....	0·14	6·56	9·6	16·3	....	....		£32/10/0 (W)
Animal Organic and Mineral Fertiliser	218	Wooltana	Wooltana Industries Pty. Ltd.	....	....	4·00	....	....	2·00	7·15	9·15	....	....		£29/0/0 (P)
3. Blood Meat Fertilisers															
4. Fish Fertilisers												Fine Material			
Crayfish Meal Fertiliser	118	Golden Gleam	Golden Gleam Fish Processing Co. Pty. Ltd.	....	....	6·25	....	....	0·85	0·75	1·60	a	100		£32/0/0 (GW)
												b	55		
Fish Fertiliser	151	Sound	Cockburn Sound Fertilisers	....	....	4·50	....	....	2·00	6·00	8·00	a	100		£28/0/0 (W)
												b	55		
Craymeal	153	do.	do. do. do.	....	....	5·50	....	....	....	....	....	a	100		£29/0/0 (W)
												b	55		
Special Fish Manure	169	Blue Cross	Agricultural Products Co.	....	....	3·50	....	....	....	....	7·50	....	....		Packets
C. AGRICULTURAL LIME															
Hydrated Lime	101	Swan	Swan Portland Cement Ltd.	Neutralising Value 93%			....	....	....	....	....	....	....		£11/10/0 (W)
															£12/0/0 (P)
Garden Lime	105	David Gray's	David Gray & Co. Ltd.	Neutralising Value 75%			....	....	....	....	....	....	....		Packets
Do.	144	Best	William J. Pascoe & Son	Neutralising Value 75%			....	....	....	....	....	....	....		Packets
Do.	188	Blue Cross	Agricultural Products Co.	Neutralising Value 75%			Calcium Carbonate 40%		....	....	....	....	....		Packets
Hydrated Lime	203	Hydro	Perth Modelling Works Pty. Ltd.	Neutralising Value 85%			CaO 70%		....	....	....	....	....		£13/10/0
Agricultural Lime	222	Wesfarmers	Westralian Farmers Co-op. Ltd.	Neutralising Value 95%			....	....	....	....	....	....	....		Packets
Garden Lime	239	Boans	Boans, Ltd.	Neutralising Value 75%			....	....	....	....	....	....	....		Packets

(PW) Perth Works. (GW) Geraldton Works. (AW) Albany Works. (PJW) Picton Junction Works.

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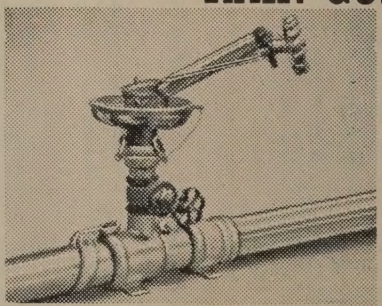

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